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QUEENSLAND AGRICULTURAL JOURNAL

GENERAL INDEX

PAGE.

A

Agriculture, The Year in 255
Agriculture in Britain 316
Agriculture, A Plan for Standardising 413
Agricultural Districts, Rainfall in the 80, 167, 253, 339, 423, 509
Answers to Correspondents 73, 157, 242, 324, 407, 501
Apple Juice and Treacle 314
Appointments and Staff Changes 72, 154, 240, 323, 406, 500
Army, How the Farmer Feeds the 77
Arts of Peace, Men of War Practise the 505
Astronomical Data for Queensland 82, 168, 254, 340, 424, 510

B

Bacon, Queensland 342
Banana Land, Checking Soil Washing on Hillside 118
Banana Rust Thrips, Brown Paper Bunch Covers for the Control of 428
Banana Suckering 429
Bananas as a Fertilizer 477
Bananas—
  Cutting Tall-Growing Bananas .. 145
  Lady Finger Bananas 239
  Marketing Bananas .. 145, 311
  Planting of Bananas, The .. 144
  Selection of Banana Suckers .. 312
  Sugar Banana 62
  Tall-Growing Varieties of .. 63
  Wind Breaks for 64
Bees, The Wonderful World of the 320

PAGE.

Beets, Table 146
Birds Should be Protected, Why .. 234
Bloating of Cattle, Acute 380
Botany—Answers to Correspondents by the Queensland Botanist, Mr. G. T. White, F.Z.S. .. 73, 157, 242, 324, 407, 501
Brisbane Exhibition, The 208
Britain's Great Agricultural War Effort 316, 341
Bruising of Cattle 459
Bull, Managing the 295
Burdekin Flood, After the .. 392
Burdekin Flood and its Lesson, The Recent 111
"By Our Own Right Hands" .. 122

C

Cabbage Growing for Market .. 475
Calves, Vealer 299
Cape Gooseberry, The 312
Cattle—
  Acute Bloating of 380
  Bruising of 459
  Crush on Every Farm, A .. 297
  Fattening 207
  Lice 48
Cemented Bag Buildings 473
Checking Soil Washing on Hillside Banana Land 118
Chemurgic Movement, Objects of the 170
Child Welfare .. 78, 163, 249, 332, 418, 506
Choko, The 248

PAGE.

Citrus Orchard, The Value of Humus in the 237

Classing the Ewe Flock 45

Climatological Table, May to November, 1940 .. 81, 167, 253, 339, 423, 509

Clovers on the Coast 473

Codling Moth Control 17

Concentrates and Licks for Dairy Cattle in Winter 47

Concrete on the Farm, The Preservation of 139

Contour Furrowing 102

Corriedale as a Farmer's Sheep, The 293

Cotton Needs, National 83

Cotton—
  The Planting of 119
  The Thinning and Cultivation of 344

Cows Calving at Show Time .. 51

Cream in the Summer, Care of .. 453

Cream, Scummy 51

Cucumber Growing 110

Cultivating New Banana Land .. 61

D

Dairy—
  Calves, To Check a Bad Habit in 461
  Cattle—Pure-bred or Grades .. 300
  Cream Blending 461
  Cream in Summer 463
  Cream Stirring 461
  Farm Essentials 463
  Dry Milking is Clean Milking .. 462
  Inferior Cream 463
  Keeping Cheese Milk Cool .. 460
  Milk Contamination 463
  Production 257
  Steam Sterilisation in the .. 270
  Treatment of Cream 462

Dairy Farm—
  Blood Meal for Dairy Stock .. 384
  Calf Feeding, An Important Point in 385
  Care of Cream in Transit .. 385
  Common Defects in Cream .. 384
  Competition 129
  Dairy Practice 383
  Palatability of Feeds 385
  Profitable Dairying 386
  Protein and Meat Meal 386
  The Separator Float 386

Dairy Farms in Relation to Increased Milk Production, The Management of 448

Dairy Farmers, "Don'ts" and "Buts" for 441

PAGE.

Dairy Heifer, Points of a 299

Dairy Industry—
  Calving Troubles 127
  The Cowyard and Milk and Cream Quality 131
  Washing Milking Utensils .. 125
  Wet or Dry Milking 126

Dairy Management 294

Dairy Practice, Right Methods in 298

Dairy Research, Progress in .. 480

Darling Pea Pest 292

Dehorning Cattle, Method of .. 435

Dip, Care of the 153

Director of Veterinary Services, New 480

Disinfection 457

Drenching Sheep 456

Drinks for Summer Days 508

Drone Citrus Trees, Reworking .. 434

Drought Feeding of Sheep .. 24

E

Egg Production 55

Event and Comment 1, 83, 169, 256, 342, 425

Erosion, River, Proserpine .. 396

Ewe Flock, The 458

Ewe Flock, Classing the 45

F

Factory Strawberries 108

Farm Kitchen, In the 80, 164, 251, 336, 420

Farm Notes 75, 161, 246, 329, 415, 504

Farm Products, New Uses for .. 169

Farmer Feeds the Army, How the 77

Farming as a Key Industry .. 1

Farming, The Call for More Mixed 415

Fat Lamb Ewe Flock, Care of the 293

Fat Lamb Quality 342

Fat Lamb Scheme, The 44

Felted Grass Coccid, The 398

Fertilizer and Manure 472

Flock Management 48

Fodder Conservation 425

Fodder Conservation Committee, Appointment of a 427

Fodder, Do Not Waste 58

Fodder, Position in Queensland, The 427

Food for Britain 84

French Beans 477

Fruitgrowers Save Soil and Water, How 74

PAGE.
Fruit Market, The 65, 147, 238, 313, 401, 478
Furrowing, Contour 102

G

Gambia Pea as a Green Manure Crop 370
Gates, Sheep-yard 379
General Notes 72, 154, 240, 323, 406, 500
Grade-Leveller 374
Grafting Male Papaws 377
Grain Sorghums are Downy Mildew Resistant 141
Grass, Para 309
Grasses, Propagation of 309
Green Manure, Gambia Pea .. 370

H

Hatcheries, Registered 53, 136, 303, 389, 468
Hay Bale Battens 452
Hay, Rhodes Grass 331
Horn-Tipping Tip, A 297
Horse Botflies 292
Horses, More Salt for 74
Horse's Nose Guard, A 373
Horses' Wounds—Simple Treatment 381
Hybrid Maize for Queensland .. 353

K

Kikuyu Grass—A Good Pasture but a Bad Weed 234

L

Lamb Marking 457
Lamb Quality, Fat 342
Land Grading, A Useful Hint when 397
Land Survey from the Air .. 474
Legume Inoculation 101
Legumes, Seed Inoculation of .. 430
Lettuce, Summer 399
Licks for Dairy Cattle in Winter, Concentrates and 47
Lime for the Garden 310
Lucerne, Establishing 471
Lucerne Hay 235

M

McNichol Grader-Leveller, The .. 374
Maintenance Ration, A 46
Maize for Queensland, Hybrid .. 353
Maize, Winter Preparation of Land for 57
Management of Winter Pastures .. 107

PAGE.
Manure Means Money 308
Maori Mite of Citrus 432
Marketing Passion Fruit 311
Marketing Pinapples 402
Marking Trees in the Orchard .. 237
Maternal and Child Welfare 78, 163, 249, 332, 418, 506
Milk in the Home—A Correction .. 67
Milk Production, The Management of Dairy Farms in Relation to Increased 448
Milk, Rejection of First-drawn .. 52
Milk Tests, Variations in 49
Milking Methods—A Comparison 367
Milking Shed, Cleanliness in the .. 447
Mite Injury to Tomatoes .. 236
Moth Control 17

N

National Cotton Needs 83
Native Couch Grass Dangerous to Stock, A 267
Native Grasses, Seeds of 233
New Banana Land, Cultivating .. 61
New Uses for Farm Products .. 169

O

Orchard, Marking Trees 237
Orchard Notes 76, 162, 247, 329, 416, 505
Orchard Tool, An Interesting .. 416
Overseas Exchange 315
Overstocking a Wrong Policy .. 293

P

Packing Sheds and Equipment .. 63
Paint Tins, Cleaning 397
Papaw Trees, Grafting Male .. 377
Para Grass—Useful in Damp Situations 309
Paris Green Bait Substitutes .. 232
Parsnip Growing 64
Passion Fruit, Marketing 311
Pasture Management 431
Phosphorus Problem in Western Queensland, The 196
Pigs—
  Bacon Pig Weights 466
  Branding of, The 467
  Breeding Sow, The 387
  Buying a Boar 465
  Castration of Pigs 134
  Charcoal for 388
  Corn Cob Charcoal for 302
  Creep Feeding Sucking 464

PAGE.

- Pigs—*continued.*
  - Farrowing Pig, The 466
  - Isolation Pen for Sick 465
  - Maize and Pork Quality .. 388
  - Paddocks for 301
  - Pig Feeding 465
  - Pig Net, How to Make .. 132
  - Risk of Feeding Raw Offal to 302
  - Salt for 467
  - Service for Pig Farmers .. 387
  - Shade for 231
  - Skim Milk for 231
  - Weight from the Wallow—Making Pigs Pay 388
  - When Selling 302
- Pink Wax Scale, The Control in Citrus Orchards 476
- Planned Development and Post-War Stabilisation 1
- Planning for Post-War Production 343
- Plant Poisonous to Stock, Soda Bush 290
- Plant-breeding and the Production of Better Seed 258
- Planting of Cotton, The 119
- Post-War Production, Planning for 343
- Post-War Stabilisation, Planned Development and 1
- Power Spray for Farm Animals, An Effective 442
- Preparation for Shearing 46
- Producer Gas Units 38
- Production, Planning for Post-War 343
- Production Recording 70, 150, 318, 405, 498
- Pig Farm—
  - Castration of Pigs 134
  - How to Make a Rope Pig-net .. 132
- Pineapple Culture in Queensland .. 4
- Pineapple Marketing 402
- Pineapple Soils of the Nambour, Woombye, and Palmwoods Districts 86, 172
- Polled Cattle 299
- Polo, Playing with a Hoe 161
- Potash, Rationing of 142
- Potato, Putting the "Pot" into the 316
- Poultry—
  - Black Comb Disease in Fowls .. 305
  - Feeding Costs in the Fowl Run 306
  - Marking Pullets 470
  - Milk as a Food for Fowls .. 307
  - Points 307
  - Purchase of, The .. .. ..
  - Size of Eggs 306
- Producers' Problems 3

PAGE.

Q

- Queensland Bacon on the British Breakfast Table 342
- Queensland Nut, Planting the .. 60
- Queensland Show Dates for 1940 .. 75

R

- Rainfall in the Agricultural Districts .. 81, 167, 253, 339, 423, 509
- Ration, A Maintenance 46
- Rationing of Potash 142
- Registered Hatcheries 53, 136, 303, 389, 468
- Registered Stallions 491
- Rejection of the First Drawn Milk 52
- Rejected Stallions 496
- Rhodes Grass as Hay 331
- Rhodes Grass, Risks in Winter Growing 58
- River Erosion in the Proserpine District 396
- Rural Topics—
  - Australian Timbers for War Industries 414
  - A Land Girl on War Service—And a Barber Beards the Barley 327
  - A New Angle on the Farmer's Problems 159
  - A New Hope for British Agriculture 245
  - A Travelling Rabbit Freezer .. 159
  - A Word for Old "Bluey" .. 413
  - Blood Meal as Sheep Food .. 244
  - Bullock, The Biggest 412
  - Chemurgy 411
  - Citrus Growers Research for the 503
  - Cow Looks for a Lick, When the 503
  - Dairy Cows, Water Meter for .. 502
  - Driving Posts with Dynamite .. 412
  - Economy of Flesh and Blood Horsepower, The 503
  - Electric Fence for Fat Lamb Raising 245
  - Export Market—Post-War Planning, The 243
  - Farmers to be "Mentioned in Despatches" 502
  - Flashes from "The Lighter" .. 243
  - Frozen Bacon for Britain .. 243
  - Goat Becomes Respectable, The 411
  - Great Cattle Weights 245
  - Harmony in the Cow-bail .. 414
  - Kudzu, A Word on 412
  - Lacquering of Fruit Cans—An Interesting Experiment .. 244
  - Lamb-Tailing Experiment, A .. 503
  - Merino Breed of Sheep, How the Breed Got Its Name 411

PAGE.

Rural Topics—*continued.*
  - Milk in the Cooler 327
  - Milk Yield, The Best Test of .. 502
  - Money in the Bag 159
  - Old "Dobbin" Wins from the Plough to the Racecourse and Back Again 328
  - Planned Production 413
  - Plough as a Weapon of War, The 244
  - Pneumatic Tyre Increases Efficiency of Farm Machinery, The 244
  - Poetry in Agriculture—The English Scene 328
  - Producer Gas Units 160
  - Progress in the Pig Industry .. 160
  - Refrigeration for Hire 327
  - Rubber Tyres Save Time .. 503
  - Save Your Soil or Perish .. 328
  - Submarine and Machinery for British Farms, The 327
  - Sweet Corn for Planting—A New Industry in the South 160
  - Value of the Light Horse, The 243
  - War and Agriculture—What Americans Think About It .. 413
  - Where the Branding Iron Should be Placed 160

S

Salt Bag Risk 309
Salt for Horses, More 74
Science and the Soil 195
Scummy Cream 51
Seed, Good, Means Good Crops .. 479
Seed Maize for Sale 75
Seed, Risk of Using Salt Bags for 309
Seedlings of Green Manure, Mixed 141
Seeds, Good 235
Sheep—
  - Adaptability of the Merino, The 123
  - Drought Feeding of 74
  - Feeding Methods 361
  - On the Farm 291
  - Raising near the Coast 382
  - Suitable Ewes for Fat Lambs .. 124

Shearing, Preparation for 46
Sheepyard Gates 379
Sick Animals, Care of 459
Silo, The Trench 474
Skeleton Weed 268
Slugs and Snails, The Control of .. 472
Soda Bush—A Plant Poisonous to Stock 290
Soil Bank, Keeping our Balance in the 322
Soil Conservation 171
Soil in Orchards, Washing of .. 400
Sorghums, The Planting of .. 394
Sorghum, Variation of the Prussic Acid (HCN) Content of Sorghum Verticilliflorum at Different Stages of Growth 364
Spray, Power 442
Stallions Registered 491
Stallions Rejected 496
Steam Sterilisation in the Dairy .. 270
Steam Sterilisation of Dairy Utensils 296
Stock Feeding, Variety in 292
Strawberries, Factory 108
Sugar Banana, The 62
Sugar Levies, 1940 Season .. 68
Swamp Lands 59

T

Table Beets 146
Tall-growing Varieties of Bananas 63
Teeth, Beauty and Good 335
Termites or "White Ants" .. 42
Tick Trefoil—A Valuable Fodder Plant 246
Tobacco, The Plough Cultivation of 349
Tomato Marketing 400
Tomatoes, Mite Injury of 236
Tomatoes, Transplanting 400
Tractor Tyres, Pneumatic 140
Treacle, Apple Juice and 314
Trefoil, Tick 246
Trench Silo 474

V

Variations in Milk Tests 49
Vealer Calves 299
Veterinary Medicine Registrations 152

W

"Waler" in Wartime 3
War Effort, A Worthwhile .. 2
Water on the Grazing Farm .. 47
Weed, Skeleton 268
Well, Selecting the Site for a .. 381
"White Ants" or Termites .. 42
Whitewash Which Lasts 395
Wind Breaks for Bananas 64
Winter-growing Rhodes Grass Risks 58
Winter Pastures, Management of 107
Winter Preparation of Land for Maize 57
Wool, Classing the Clip 382

Y

Yellowwood (Poisonous to Stock) 458

INDEX TO ILLUSTRATIONS

PAGE.
Access Road to Newly Settled Country, Innisfail District, North Queensland 497
Blood Mares and Foals Yarded, Northampton Downs, Western Queensland 317
Brazilian Lucerne, showing Promise as a Pasture Legume 417

Brisbane Exhibition, The—

Sir Leslie Orme Wilson Declaring 1940 Show Open 209
The Church and Air Force were Worthily Represented 209
The Grand Parade 210
The Navy, the Army, and Air Force formed a Guard of Honour 211
The Winning "A" Grade District Exhibit 212
The Winning "B" Grade District Exhibit 213
The Winning District Fruit Display 215
Cotton for the Commonwealth .. 216
Apple and Pear Varieties in Colourful Contrast 217
Display Arranged by the Apple and Pear Board 218
Troop of Queensland Mounted Police—the Governor's Escort 219
Wealth of the Western Pastures 219
How Animal Health is Preserved 220
Health and Wealth in the Dairy 221
Irrigation in the Orchard .. 221
The Dairy "Ideal" 222
Cereals in Sheaf and Grain .. 223
A Section of the School Project Club Fruit Packing Display .. 223
Pyramid of Pineapples was a Winning Exhibit 224
Agricultural S.O.S.—"Save our Soil"—Methods Illustrated .. 225
Fodder Conservation 226
Grain Sorghums 227
Pasture Grasses and Poisonous Plants in Educational Contrast 228
The Eternal War Against Vegetable Pests and Diseases .. 229
The Poultry Alcove in the Agricultural Court 230
The Journal Corner 230
Points in Piggery Management 231
Champion A.I.S. Cow 481
Champion Butter-fat Cow .. 481
Australian Illawarra Shorthorns—Team of Four Cows (A.I.S.) 482
Champion Ayrshire Bull .. 482
PAGE.
Champion Jersey Bull 483
Champion Jersey Cow 483
Champion Friesian Bull 484
Champion Friesian Cow 484
Champion Guernsey Bull .. 485
Champion Guernsey Cow .. 485
Champion Polled Hereford Bull 486
Champion Hereford Bull .. 486
Champion Shorthorn Bull .. 487
Champion Shorthorn Cow .. 487
Champion Devon Bull 488
Champion Devon Cow 488
Champion Polled Shorthorn Bull 489
Champion Polled Shorthorn Cow 489
Champion Aberdeen Angus Bull 490
Champion Aberdeen Angus Cow 490

Burdekin Flood, After the—

A Sanded Field which has been Scooped and Ploughed .. 392
Illustrating the Extent and Nature of the Sanding Experienced in Certain Fields .. 393
Showing a Lucerne Field from which the First Cut had just been Removed 393

Burdekin Flood and Its Lessons—

Engine and Concrete Bed moved by the Force of the Flood .. 116
Low-lying Fallow Field which has Benefited from a Deposit of Silt 117
This Field Received a Deposit of Rich Silt Twelve Inches Deep 117
Formerly a Canefield Carrying an Excellent Plant Crop 115
Showing How an Irrigation Pump and Concrete Piping were Damaged when the Bank was Eroded 115
Deep Bed of Sand was Deposited on this Fallow Field and the Adjacent Cane 113
Showing How the Flood Waters Washed Out and Destroyed Concrete Water Piping .. 114
Showing a Deep Gully on a River Alluvial Farm 112
Illustrating the Manner in which the Surface Soil was Eroded from a Recently Ploughed Field; Forest Soil 113
Cane Farmers Listening to a Lecture at a Field Day at Meringa, North Queensland 417
Carey, L. D., Chief Inspector of Stock 156

PAGE.
Close to the Job, Swedish Rototiller at Work Mixing Fertilizer with the Soil 146
Codling Moth Control—
  Diagram showing Codling Moth Activity and Mean Weekly Temperature at the Summit .. 26
  Diagram showing Codling Moth Activity and Weekly Mean Temperatures at Various Centres in Stanthorpe District, 1938-39 28
Contour Furrowing—
  A Furrowed Slope 102
  Water Holding Furrows .. 103
  Diagram Illustrating the Variations in Spacing according to Slope between Two Contour Furrows 104
  Unstumped Condition of Hillside with 21 per cent. Slope no Deterrent to Effective Contour Furrowing 105
  Home-made Wooden Levels may be Used Successfully in Plotting Contour Lines 106
Cotton, The Thinning and Cultivation of—
  A Cultivated Clean Field Speeds up the Rate of Thinning, thereby Reducing the Cost of this Important Operation .. 345
  Illustrating when the First Cultivation of Cotton should be made 346
Cotton Progeny Row Breeding Plot at the Biloela Research Station 264
Dehorning Cattle, Methods of—
  Dehorning Instruments 436
  Method of Holding Calf for Dehorning 436
  Dehorning Bail at the Animal Health Station, Oonoonba .. 437
  Steer in Bail Ready for Dehorning 437
  Guillotine-type Dehorner in Position for Removing Horn .. 438
  Yearling and Two-year-old Dehorned Steers at Pasture .. 440
Factory Strawberries—
  Case of Well-selected Berries in Good Condition with No "Nested" Fruit 108
  Case of Poorly Selected Berries 109
Florida Oshima Cow Cane—A Stand-by for Stockowners .. 404
Gambia Pea as a Green Manure—
  Illustrating a Young Gambia Pea Crop at Bundaberg Station, January, 1940 370

PAGE.
  Showing One of the Best Crops Produced last year on the Mourilyan Sandy Soil 371
  Illustrating the Ease of Ploughing-under a Heavy Crop on Babinda Gravelly Soil .. 372
Hay Bale Batten Specimens Selected from a Market Consignment 455
Horse's Nose-Guard, A 373
Hybrid Maize for Queensland—
  Diagram showing Results of Farm Trials 354
Hybridizing Wheat 266
Iliff, H. A., Registrar of Brands .. 156
Lake Manchester, near Brisbane .. 138
Land Levels—Illustrating the way in which Petrol Tins may be Used in Finding Levels .. 397
Papaw Trees, Grafting Male—
  Grafted Papaw, Four Months after Grafting 377
  Papaw Cleft Graft 378
Phosphorus Problem in Western Queensland—
  Hock-Deep in Rich Pastures .. 197
  A Brigalow Grove Reserved as a Shade for Stock on Bybera .. 199
  Brigalow County in its Natural State 200
  From Dense Scrub to Sweet Pasture Paddock on Bybera .. 201
  Sheltered Tick Trough in a Bybera Paddock 204
  A Favourite Rendezvous for Cattle 205
McNichol Grade-Leveller—
  The Leveller Operating in a Scooped Field 374
  Illustrating How Readily the Leveller may be Turned on the Headland 375
  An Example of the Class of Work done by the Leveller 375
Pigs—
  Diagram showing Method of Making a Rope Pig-Net .. 133
  A Modern Berkshire Pig .. 467
Pineapple—
  Diagram showing Mean Daily Temperature in Queensland and Honolulu-Hawaii .. 7
  Map showing Principal Producing Region in Queensland .. 5
  Other Centres where Pineapples are Grown Commercially .. 5

PAGE.

Pineapple Soils—

Diagram, Coe's Creek Sand .. 96
Diagram, Coe's Creek Sandy Loam 97
Diagram, Palmwoods Sand .. 94
Diagram, Palmwoods Sandy Loam 95
Diagram, Woombye Sandy Loam 91
Diagram, Woombye Loam .. 92
Diagram showing Mean Monthly Rainfall and Mean Monthly Evaporation in Inches .. 89
Diagram, Nambour Sand .. 98
Diagram, Rosemount Sand .. 99
Diagram, Rosemount Clay Loam 100
Diagram of Profile Development of Soil Types, showing the Increase of Clay Content with Depth 177
Diagram showing Moisture Equivalent in Loam, Sandy Loams, and Sand 181
Diagram Buffering Curves of Surface Soils 186
Diagram of Summation Curves, illustrating Typical Mechanical Analyses of Surface Samples 175
Diagram of Mechanical Analysis Distribution Triangle of Surface Soils 172
Diagram of Mechanical Analysis Distribution Triangle of Subsoils 173

Power Spray for Farm Animals—

An Effective Power Spray Plan 443
A Side View of the Spraying Crush 444
The Power Spray Crush from Another Viewpoint 445

Queensland Co-operative Bacon Association 135

River Erosion—Showing the Serious Break in the Proserpine River Bank caused by Erosion during the Recent Flood .. 396

Seddon, Professor H. R., D.V.Sc., Director of Veterinary Services 480

Sheepyard Gates 379

Skeleton Weed 269

Sorghum Breeding Plot at the Biloela Research Station .. 264

Sorghum—

Two Excellent Grain Sorghum Heads Produced at the Bundaberg Sugar Experiment Station 376
Plot of Grain Sorghums, Meringa 395

Steam Sterilisation in the Dairy—

Polluted Allegedly Clean Can—Rinse of Quality Affecting Bacteria 273
Rate Exposures in Dairy, Illustrating Contamination by Airborne Bacteria about the Dairy 273
Yeasts Isolated from Whey in Milk Cans 274
Impressions of Allegedly Clean Udder Cloth 274
Polluted Water Supply in Tank adjoining Dairy 275
Before Sterilisation, Milk Direct from Udder (sterile) 276
After Sterilisation, Milk from Can which had been Sterilised 276
Before Sterilisation of Milking Machine 277
After Sterilisation of Milking Machine 277
Before Sterilisation, Cream from Separator 278
After Sterilisation, Cream from Separator 278
Before Sterilisation, Cream from Can 279
After Sterilisation, Cream from Can 279
Before Sterilisation, Effect of Injurious Bacteria on Milk .. 280
After Sterilisation, Note Clean Firm Curd 281

Tobacco—The Plough Cultivation of Tobacco 352

Tool Rack 366

Wheat—In the Wheat Lands of the Darling Downs 56

Young Farmers at the Sydney Show 149

AUTHOR INDEX

PAGE.

Bryan, W. W., and A. J. Schindler—
Hybrid Maize for Queensland .. 353

Buzacott, J. H.—
Termites or "White Ants" .. 42

Caldwell, N. E. H.—
Brown Paper Bunch Covers for the Control of Banana Rust Thrips 428
Maori Mite of Citrus 432

Carey, L. D.—
The Effective Power Spray for Farm Animals 442

Coleman, F. B.—
Hay Bale Battens 454

Gregory, J. H.—
Factory Strawberries 108
The Fruit Market 65, 147, 238, 313, 401, 478

Hancock, W. G.
Grafting Male Papaw Trees .. 377

Harvey, J. M.—
Sheep Feeding Methods 361

Hirschfeld, Dr. E.—
The Phosphorus Problem in Western Queensland 196

Keighley, M. Ward—
Codling Moth Control, Reports on 1938-39 Investigations .. 17

Kerr, H. W.—
The Recent Burdekin Flood and its Lessons 111
Gambia Pea as a Green Manure Crop 370
The McNichol Grader Leveller 374

Lewcock, H. K.—
Pineapple Culture in Queensland 4

McNee, H., and L. F. Mandelson—
349

PAGE.

McKnight, T.—
Seed Inoculation of Legumes .. 430

Mandelson, L. F., and H. McNee—
The Plough Cultivation of Tobacco 349

Miles, L. G.—
Plant Breeding and the Production of Better Seed 258

Mulhearn, C. R.—
Methods of Dehorning Cattle .. 435

Nichols, L. E.—
Steam Sterilisation in the Dairy 270

Park, W. J.—
Milking Methods—A Comparison 367

Schindler, A. J., and W. W. Bryan—
Hybrid Maize in Queensland .. 353

Skilkin, J.—
The Management of Dairy Farms in relation to Increased Milk Production 448

Skinner, A. F.—
Contour Furrowing 102

Vallance, L. G., and H. L. Wood—
The Pineapple Soils of the Nambour, Woombye, and Palmwoods Districts .. 86, 172

Wells, W. G.—
The Planting of Cotton .. 119

White, C. T.—
Answers to Correspondents (Botany) 157, 242, 324, 407, 501

Winks, W. R.—
Variations of the Prussic Acid (HCN) Content of *Sorghum verticilliflorum* at Different Stages of Growth 364

Wood, H. L., and L. G. Vallance—
The Pineapple Soils of the Nambour, Woombye, and Palmwoods Districts .. 86, 172

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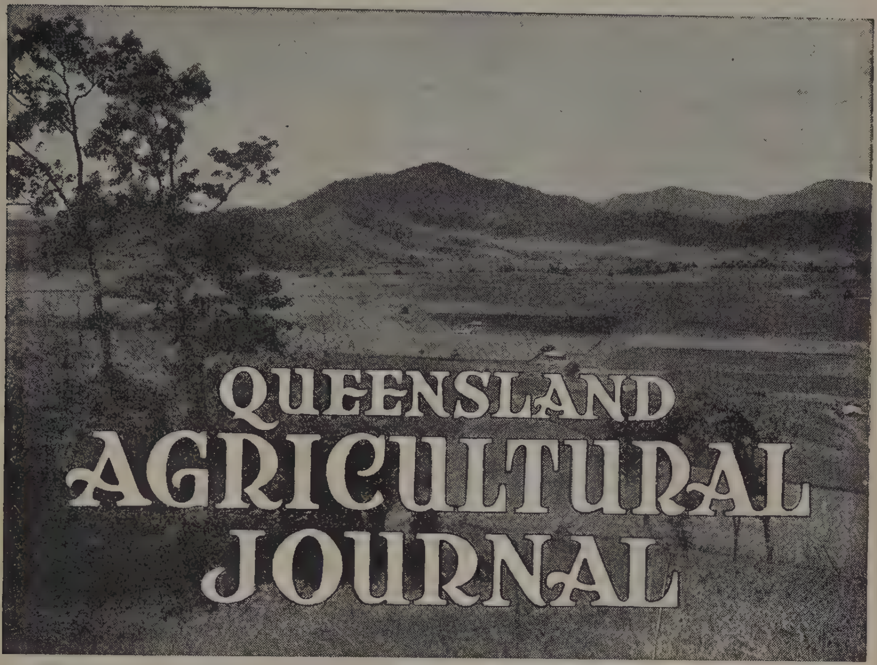

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Event and Comment

Farming a Key Industry.

FARM production is regarded as a key industry in the present national emergency, even by recruiting staffs. Those outside the military service categories are urged to go on producing to their full capacity and maintain high-quality standards. It is now generally recognised that among our best efforts for the nation is the production of commodities essential for the feeding and clothing of our troops, the civil population, and the many thousands of homeless and destitute people who, by stress of war and invasion, have come under the protection of the British Commonwealth. Then, too, we have to consider the requirements of the position which will inevitably develop after the war. We have to prepare for the challenge to many of our primary industries, wool-growing particularly, by artificial substitutes. Incidentally, a tribute is due to the men and women of the land who are contributing so magnificently to the war effort, not only in respect of increased production, but of direct money subscriptions as well. Never has it been more impressively demonstrated that in war as well as in peace it is the country people who form the real foundation of a nation.

Planned Development and Post-war Stabilisation.

THE recent meeting at Canberra of the Australian Council of Agriculture, consisting of Ministerial representatives of Commonwealth and State Governments, was a notable event. Naturally, war-time needs occupied most of the attention of the Ministers, all of whom recognise the fact that there is a vast land force throughout Australia capable of being mobilised in the national interest for the planned development and post-war stabilisation of our primary industries. Through a really national effort we can increase wartime production, while also planning and preparing for the aftermath of world-wide commercial disorganisation.

The war, it is acknowledged, has placed new responsibilities on farmers and graziers, all of whom have vital contributions to make as units in the army of production. As exporters in competitive markets we have, it is repeated, to prepare to face trade rivals with high-grade standardised products which will command preference on merit. Therefore, our watchwords at all times have to be quality, uniformity of quality, and continuity of supply. With an orderly plan of balanced output Australia will do her job in satisfying the needs of the Empire under war conditions, and of the world during the period of economic reconstruction which must follow.

A Worth-while War Effort.

MANY producers are of opinion that a policy of systematically levelling up the production of live stock during the war should be adopted. That would be regarded as a worth-while war effort which could be made a duty. To do this it would be necessary to conserve more fodder and sow more forage crops in districts suitable for their cultivation. Till now, fodder conservation has been regarded, more or less, as an insurance against serious drought; but we may yet have to provide for a more systematic supplementing of natural pastures during dry spells in order to level up production. To do this without touching our drought reserves means increasing the quantity of fodder stored and increasing the acreage of fodder crops sown in the course of normal practice. It is believed that if the steep rise and fall in Australia's exportable surplus of primary products could be kept at a more satisfactory level, it would help in the negotiation of war and post-war trade agreements. Not long before the war we had practically reached a limit on the British market and were confronted with both actual and prospective impositions of restrictive quotas in respect of some of our commodities. When the requirements of the Australian home market are considered, there is, apparently, less need to worry. The stimulation of the production of commodities which hitherto have figured on inward manifests, and in respect of which it is necessary to save exchange charges, will be welcomed by primary producers. Apart from growing crops to take the place of commodities normally imported, the fact that once more it has been demonstrated that the Australian market for primary produce is the most profitable should not be ignored and, therefore, we should do our best to look after it. It is reasonable to expect a big increase in population after the war—mostly because of large migrations from war-worn countries—and that will mean even a better home market. Every man, woman, and child who comes here shall have to be fed and clothed. With some products, it should not be necessary to wait until the war ends. Take wool, for instance. Look what it would mean to the pastoral industry if every woman could be induced to cease wearing synthetic fabrics and wear good Australian wool! However, Australian producers are wideawake to the opportunities of national service, both in war and peace, which are now in their hands.

Producers' Problems.

FARMERS all over Australia are facing peculiar problems. With many farm products the war has assured a market for the duration and for a certain after period of readjustment, but that does not, however, absolve producers from the duty of maintaining their products at the highest possible standard of quality and from keeping an eagle-eye on the requirements of markets already established or likely to be developed. On producers rests the responsibility of studying war-caused marketing problems, and of deciding how best to serve Australia and the Empire. In many primary industries the output has to be kept as high as possible, and while that is being done, it will be necessary to plan for the future. Some markets held before the war may be lost to us after the war, and other markets may have to be found. One encouraging development is the growing use of farm products for the manufacture of plastic and other materials used in secondary industry. Farmers can take as big a share in the united national effort now being made as those engaged in any other industry, and Australia is fortunate in that the vast majority of her primary producers are men of vision and enterprise who are not likely to neglect the call for present economy and efficiency, and for careful long-range planning.

A Word for the "Waler" in War Time.

ACCORDING to General Sir Harry Chauvel, who commanded the Australian Light Horse and other cavalry divisions in the last war, if Australians are ever compelled to fight an enemy on their own soil, our difficulties will be greater if there is not available a large force of mounted troops, with adequate remount reserves.

In Palestine and during the South African war, the Australian Light Horse fought in the same way they would have to fight if war ever comes to Australia. In those campaigns, horses were called on for feats of endurance almost incredible. In the Sinai campaign, Australian "walers" for months lived on scanty rations, after surviving a long sea voyage, in a country which did not even grow grass and where water was very scarce. It was not unusual for them to carry heavy loads over soft sand for up to forty-eight hours on one watering. In some cases horses were known to go without water for eighty-four hours, covering long distances, and carry as much as 20 stone on their backs.

Unfortunately, the present generation of Australians is doing little to maintain that splendid breed of horses, but it is not too late to stop the decline and increase the rate of breeding.

Our job is to continue to produce that tough, robust "waler," with his tremendous powers of endurance and recuperation so much in evidence in the campaign of the Desert Mounted Corps. It will be many years before the motor will replace the horse completely. Many horses, it is true, have been replaced by mechanised traction, but nothing has yet been devised to take the place, under conditions which certainly exist in all parts of Australia, of the soldier who can fight mounted or on foot, meet quickly changing circumstances, and live on the country.

Pineapple Culture in Queensland.

H. K. LEWCOCK, M.Sc., B.Sc.Agr., Senior Research Officer.

(*Continued from page* 277, *March,* 1940.)

CHAPTER VI.—CLIMATIC INFLUENCES.

WHILE the pineapple is dependent on the soil for its supply of water and mineral nutrients, the extent to which these substances may be available, and the ability of the crop to utilise them, is determined largely by climatic influences. In a locality where climatic conditions depart from those most favourable for the development of the crop, particular care is necessary in the laying out and management of the plantation.

For its best development the pineapple requires warm, equable temperatures, moderate rainfall, and high atmospheric humidity. Such conditions are found normally only in tropical or sub-tropical latitudes, though latitude alone affords little indication of climate. Altitude, distance from the ocean, and the direction of the prevailing winds all exert considerable influence on the climate of a region, irrespective of its distance from the equator.

TEMPERATURE.

Of all the features which constitute climate, temperature is the one which chiefly limits the distribution of the pineapple as a field crop. Not only is the pineapple intolerant of frost, but its growth is almost entirely inhibited when the mean temperature falls below 60 degrees F. The mere existence of the crop cannot be regarded as evidence of suitable temperature conditions; low winter temperatures may reduce its yielding potentialities to the point where profit disappears though the plants remain. Apart from their influence on yield, however, low temperatures affect both the quality of the fruit and the time which they take to reach maturity. On the other hand, unduly high temperatures (90 degrees F. or more) may cause scalding of the succulent foliage of young plants and wastage of fruit through sunburn.

Other conditions being favourable, the pineapple thrives best in localities having a mean annual temperature between 70 and 80 degrees F., provided the seasonal range lies within the limits already indicated. It is for this reason that large-scale commercial production of pineapples is confined to regions enjoying an oceanic climate, viz., Hawaii, Malaya and Formosa. In fact, as far as this crop is concerned, it may be laid down as a guiding principle that the more equable the temperature the more suitable the climate.

In Queensland, temperature conditions limit the cultivation of the pineapple to the territory which lies between the eastern coastline and the mountain ranges which parallel it for the greater part of its length. From the New South Wales border to Cooktown, this extends over 1,100 miles and includes a range of latitude of nearly 15 degrees. For economic reasons, however, more than 90 per cent. of the existing production is obtained from districts which lie between the 26th and 28th parallels, that is, between Gympie in the north and Brisbane in the south, a distance of approximately 100 miles. (Plate 1.) The rise of the

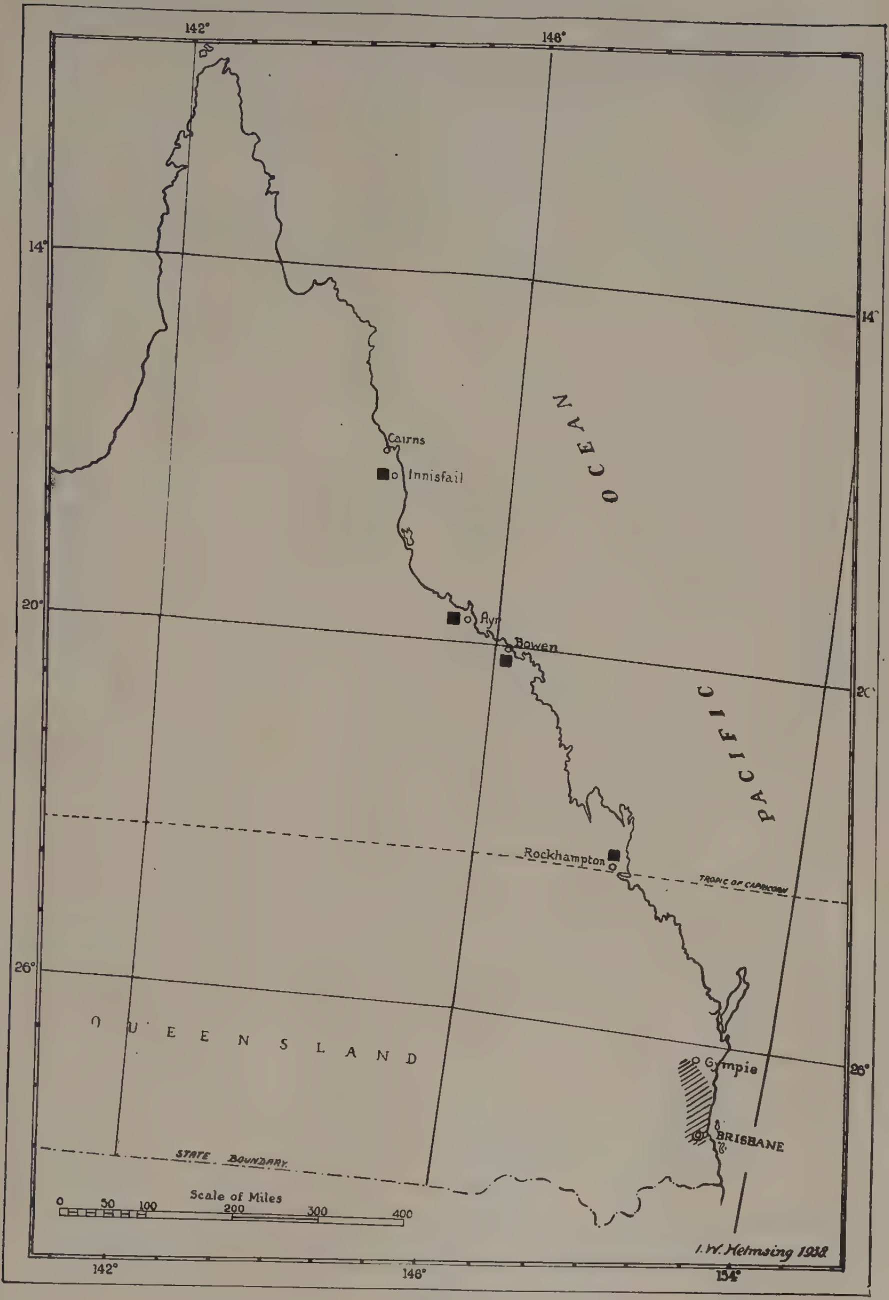

142°
148°
14°
14°
20°
20°
26°
26°
OCEAN
PACIFIC
Cairns
Innisfail
Ayr
Bowen
Rockhampton
TROPIC OF CAPRICORN
QUEENSLAND
Gympie
BRISBANE
STATE BOUNDARY
Scale of Miles
0
50
100
200
300
400
I. W. Helmsing 1938
142°
146°
154°

Plate 1.

▨ PRINCIPAL PINEAPPLE-PRODUCING REGION IN QUEENSLAND.

■ OTHER CENTRES WHERE PINEAPPLES ARE GROWN COMMERCIALLY.

industry in this south-eastern portion of the State has resulted from its proximity to local and interstate fresh fruit markets which, until quite recently, absorbed a major proportion of the crop.

Significance of Range of Temperature as Opposed to Mean Temperature.

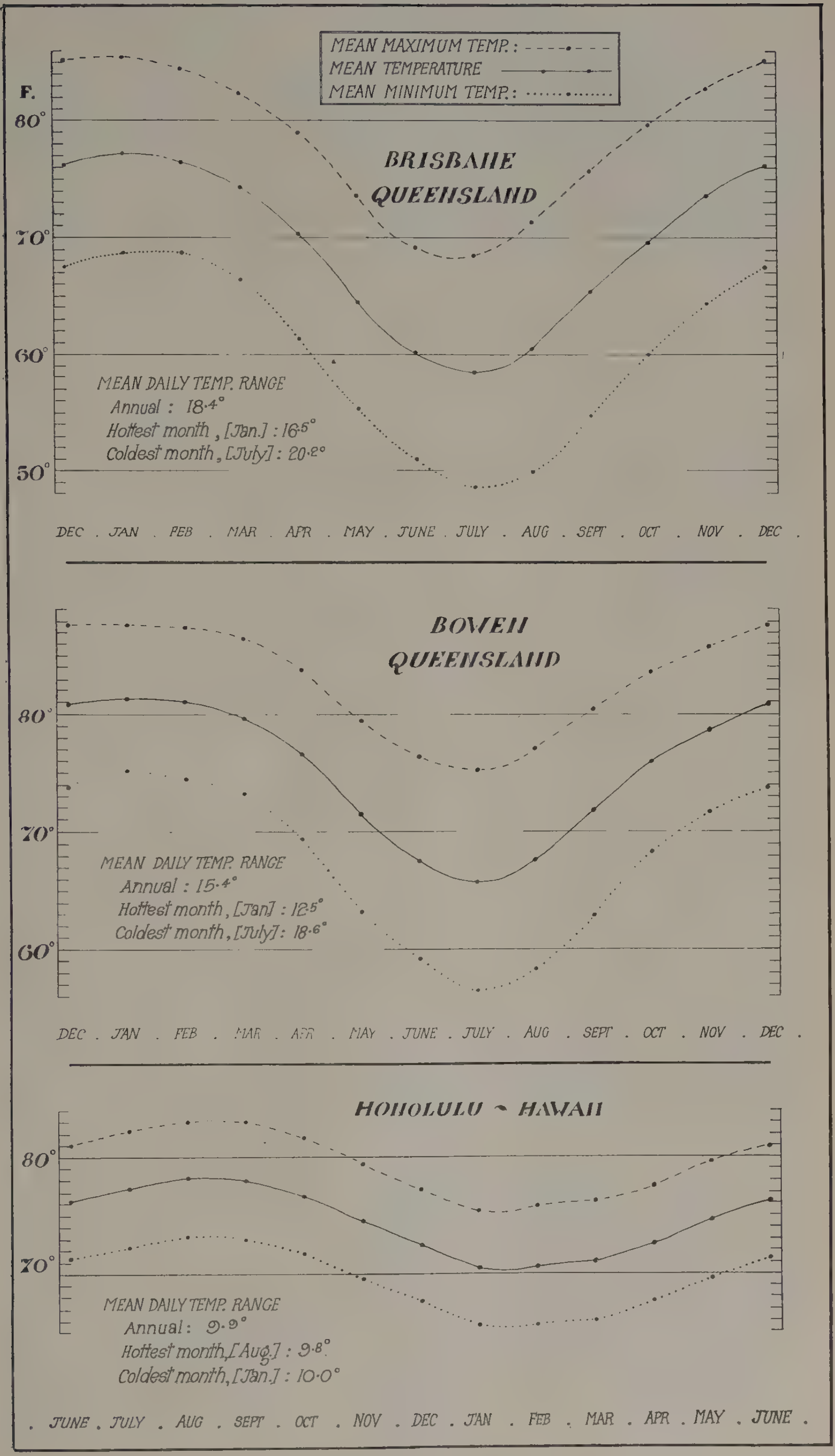
Because the range between winter and summer temperatures tends to be greater both with increasing latitude and altitude, even in coastal areas, the seasonal range of temperature—in contrast to the mean annual temperature—is of the utmost importance in determining the suitability of a locality for pineapple culture. In illustration of this point, temperature data for several localities along the Queensland coast where pineapples are grown, and also for representative localities in other pineapple-producing countries, is presented in the following table:—

TABLE I.

TEMPERATURE DATA FOR PINEAPPLE-PRODUCING LOCALITIES IN QUEENSLAND AND IN OTHER COUNTRIES.

Locality.	Latitude.	Height above Sea Level (feet).	Mean Temperature (Annual). Deg. F.	Mean Temperature (Hottest Month). Deg. F.	Mean Temperature (Coldest Month). Deg. F.
Brisbane, Q.	27.30′S.	137	68·9	77·1 (Jan.)	58·5 (July)
Rockhampton, Q. ..	23.26′S.	37	73·1	80·6 (Dec.)	62·5 (July)
Bowen, Q.	20·00′S.	16	74·9	81·5 (Jan.)	65·8 (July)
Cooktown, Q. ..	15.28′S.	17	76·5	82·5 (Dec.)	72·5 (July)
Honolulu (Hawaii) ..	21·18′N.	20	74·4	78·1 (Aug.)	70·5 (Jan.)
Johore (Malaya) ..	1.40′N.	10–200 (approx.)	80·0	..	..
Bukidnon (Philippines)	8.30′N.	2,000 (approx.)	74·0	..	..
Port Elizabeth (South Africa)	33.58′S.	50–100 (approx.)	63·6	..	..

Many of the cultural problems attending the profitable production of pineapples in southern Queensland are partly or wholly attributable to the effects of low winter temperatures. At Brisbane, for example, the mean minimum temperature for the coldest month of the year (July) is 48.5 degrees F. while for the coldest month at Honolulu (January) it is 65.5 degrees F. The range between the mean maximum and mean minimum temperatures at these two localities, and also for Bowen, Queensland, which is situated approximately the same distance from the equator as the southernmost island of the Hawaiian group, is shown graphically in Plate 2. It will be noted firstly, that the average daily range of temperature at Brisbane is nearly twice as great as it is at Honolulu and 3 degrees F. greater than at Bowen; and secondly, that the average minimum midwinter temperature at Brisbane is 8 degrees F. lower than at Bowen. Moreover, at no time of the year does the mean temperature at Bowen, or in any coastal area northwards from Rockhampton fall below 60 degrees F., unlike the conditions which obtain in south-eastern Queensland. In the latter region, vegetative growth of the pineapple is almost entirely arrested by the low temperature conditions which prevail during July and August, while optimum temperature conditions for growth persist only from the beginning of November until the end of April, i.e., during six months of the year. At Bowen, however, growth is never entirely inhibited and favourable



MEAN DAILY TEMP. RANGE
Annual : 18·4°
Hottest month, [Jan.] : 16·5°
Coldest month, [July] : 20·2°

MEAN DAILY TEMP. RANGE
Annual : 15·4°
Hottest month, [Jan.] : 12·5°
Coldest month, [July] : 18·6°

MEAN DAILY TEMP. RANGE
Annual : 9·9°
Hottest month, [Aug.] : 9·8°
Coldest month, [Jan.] : 10·0°

Plate 2.

temperatures are experienced over at least nine months of the year, i.e., from the middle of September until the middle of June. Comparing temperature conditions at Honolulu with those which have been recorded in pineapple-growing areas in Queensland, it will be seen that the mean temperature at this station always lies within the optimum growth range of 70 to 80 degrees F., and that the range between mean maximum and mean minimum temperatures remains practically constant around 10 degrees F. It is this attribute of equable climatic conditions, more than any other, that renders the Hawaiian Islands so well adapted for pineapple culture. In these islands as elsewhere, however, temperature is the chief factor limiting the use of land for pineapple-growing, since above an altitude of 2,000 feet the mean temperature is generally below that necessary for production on a commercial scale.

Influence of Aspect on Temperature.

Despite the relatively unfavourable temperature conditions which prevail over much of the coastal area of southern Queensland during the winter months, experience has shown that pineapples can be profitably cultivated in this region—and even high yields obtained—if care is exercised in the selection of the plantation site. Because of the hilly nature of the country, certain locations are noticeably warmer than others, since aspect has a marked effect on local temperatures. In particular, northern slopes are warmer than southern slopes because they are more directly exposed to the sun's rays. In this connection it should be noted that the mean soil temperatures of opposed slopes generally differ to a much greater extent than the mean air temperatures, because soil both warms and cools more slowly than air. The effect of such local temperature differences is reflected not merely in the growth of the crop, but also in the length of time which the fruit takes to reach maturity; a difference of several weeks in the ripening period on the northern and southern slopes of the same hill is not unusual. In effect, therefore, a difference in aspect may be equivalent to location in a climatic zone many miles northward or southward as the case may be. It is for this reason that northerly and north-easterly slopes are generally to be preferred for pineapple culture in southern Queensland. Under average conditions, however, westerly and south-westerly slopes are perhaps even less desirable than southerly ones because, while they receive very little more winter sunlight, they are fully exposed both to the drying influence of the cold spring westerlies, and to the burning afternoon sun during the summer months. The damage inflicted on maturing fruit by sunburn is always most acute on westerly slopes because the sun does not strike at its hardest until after the moisture content of the air has been reduced by rising temperatures; on a clear summer day the maximum temperature is usually not recorded until two or three o'clock in the afternoon.

Influence of Altitude on Temperature.

In contrast to the Hawaiian Islands, the fall in temperature which is associated with increase in altitude is not an important factor in limiting the choice of land for pineapple culture in southern Queensland because the coastal ranges in this region rarely exceed a height of 1,400 feet. In a general way, this corresponds to a decrease of about 3 degrees in the mean annual temperature, but since the fall is greater in summer than in winter its effect on the growth of the pineapple plant, compared with that which takes place at lower altitudes, is not so pronounced as its effect on the length of time which the fruit takes to reach maturity. Along the Blackall Range, for example, the peak harvest period for both the winter and summer crops occurs several weeks later than it does in the neighbouring foothill districts of Woombye and Palmwoods. Delayed ripening of the crop, due to low temperatures, is usually associated with a smaller average fruit size and, consequently, a reduction in yield, but compensating this to some extent is the higher prices at which the product is marketed because of decreased supplies from other sources.

FROST.

Though retardation of growth occurs at temperatures far in excess of the freezing point, the geographic limits to the field culture of the pineapple are set by frost. While pineapples can be grown in localities which are subject to occasional light frosts, only special circumstances, such as proximity to markets, enable the crop to be profitably cultivated under such conditions. Areas in which damaging frosts are regularly experienced are entirely unsuitable for pineapple-growing, and this is the chief factor limiting the distribution of the crop in Queensland. In practically all of the recognised pineapple districts in the southern part of the State there are sites or locations which are susceptible to frost. Furthermore, in this region, an occasional frost may cause heavy losses over areas which are generally considered to be frost-free: consequently, in the selection of a site for pineapple culture special care must be taken to avoid locations which are subject even to sporadic frosting.

Influence of Topography on Frost Occurrence.

Frost may be caused either locally by radiation, in which case usually only a thin layer of air near the ground is chilled below freezing point, or heavy, cold air from outside may flow down into natural depressions, filling them to a much greater depth and so exerting a far greater effect than is usually the case with ground frosts.

It is this second type of frost which chiefly causes injury to pineapples and its occurrence is greatly influenced by local topography. This is why, in the coastal districts of southern Queensland, the susceptibility of a location to frost is determined more by its elevation in relation to that of the surrounding country than by its actual height above sea level. On clear, calm nights during winter and spring, the minimum temperatures experienced along the bottom of a valley may be from 6 to 10 degrees F. lower than those on the hilltops on either side of it, due to the fact that cold air always settles towards the lowest levels. For this reason, slight elevation frequently secures freedom from winter frosts, even on the sides of narrow valleys. However, the degree of frost protection which is secured by selecting a raised site depends not only on the amount of elevation, but also on the area of the ridge or slope from which the cold air drains in comparison with that of the valley or depression to which it settles. If the latter is restricted in area and has little or no outlet, while the slopes leading to it are extensive, relatively little downward movement of air can occur. In consequence, the frost line in a narrow enclosed gully generally extends to a much higher elevation than it does in a broad, open valley. Sometimes, however, a belt of trees or shrubs, which at other times serves admirably as a windbreak, may so obstruct the downward movement of cold air on calm nights that the frost protection which an elevated site would normally afford is not fully obtained.

Though frost occurrence in all of the pineapple-growing districts in southern Queensland is generally related to topographical influences, it is particularly so with respect to the foothills country which lies between the Blackall Range and the sea, and in which are located several of the oldest and most important producing centres, viz., Nambour, Woombye and Palmwoods. Along the eastern rim of the Blackall Range itself, however, frosts rarely if ever occur—although the altitude ranges from 1,200 to 1,400 feet—because of the moderating influence of the warm air currents which rise from the foothills below, or which blow in from the ocean. Similarly, the upper slopes of the Mary Valley, which lies about twenty miles inland, are still sufficiently affected by marine influences to be protected against frost, due to the fact that it is open to the warm northerly winds but is sheltered from the cold south westerlies and south easterlies. The floor and lower slopes of this valley, however, are subject to severe frosts because the protection which the surrounding hills afford against southerly influences also prevents the escape of the cold air which collects along the river flats. On the other hand, flat country which opens on to the coast is almost invariably frost-free, irrespective of its elevation, because of the moderating influence of the ocean breezes which sweep over it; the districts which lie between Caboolture and Landsborough, as well as Redland Bay and Manly, fall into this category. In fact, it is not too much to say that freedom from frost in southern Queensland is, in general, determined by marine influences, and it is for this reason that pineapple culture in this region is commercially practicable only along the coastal belt.

Protection against Frost.

The best method of ensuring against frost is discrimination in the selection of a plantation site. Over most of the coastal belt in southern Queensland a considerable latitude in choice is available, though in some places the line that divides desirable and undesirable locations is very finely drawn. However, in cases where immunity from frost is deliberately exchanged for other advantages, such as proximity to markets or a delayed ripening period, it should be clearly recognised that the exchange can be profitable only with respect to locations in which frosts are neither numerous nor severe.

In locations in which a frost hazard is known to exist, it will be necessary to employ some form of protection for the developing fruits if severe losses are to be avoided. Almost any form of covering may be used for this purpose, though perhaps the most convenient and satisfactory is that provided by brown paper bags or cylinders of a size such that they may be slipped readily over the tops of the maturing fruit. The paper from which the bags are made should be sufficiently thick and tough to stand up to the weather conditions which are likely to be experienced while the fruit is ripening. Dried grass may be used as a covering in place of paper bags, but it is seldom as satisfactory, partly because of the difficulty in arranging it so that it will afford complete protection to the fruit, and partly because it is apt to be dislodged by strong winds. Owing to the cost of the labour and materials involved, it is seldom either practicable or profitable to attempt to cover the plants themselves as a protection against frost injury. Dried grass is sometimes used for this purpose, but it is questionable whether the practice affords any additional benefit over that obtained from covering the fruit alone; in fact, it is more likely to cause injury because of the exclusion of light from the leaves which it entails. The use of smudge fires to produce a screen of smoke as a protection against frost is not recommended in pineapple plantations because, as is explained later, one of the constituents of smoke has the effect of inducing premature blossoming in pineapple plants and the suckers arising from them. In any case, it has been demonstrated that smoke screens as such have little protective effect against frost.

RAINFALL.

Between very wide limits, total rainfall is of little significance in determining the climatic range of the pineapple. Apart from other considerations, however, regions or districts may vary widely in their suitability for pineapple production on a commercial scale because of differences in the seasonal distribution and intensity of the rainfall. In fact, where other conditions are favourable, distribution of the rainfall is the dominant factor in determining the profitable production of fruit. The importance of this factor has been emphasised already in discussing the water requirements of the pineapple (Chapter V.). In one locality, for example, the average rainfall may be considerably less than in some other, but the falls may be better distributed and less torrential, which would largely offset the difference in actual amounts. That portion of the total rainfall which runs off the surface of cultivated ground into watercourses or swamps is obviously lost to the crop, and the extent of this loss is chiefly determined by the intensity of the precipitation and the degree of slope; contributing factors are the type of soil and the methods employed in its cultivation. Because of these and other considerations—such as variation in the moisture-holding capacity of the soil, the effect of temperature on the moisture requirement of the crop and the rate of water loss by evaporation—it is not easy to define what deficiencies in rainfall constitute damaging droughts over any given area. In no part of Queensland in which temperature conditions are favourable for pineapple culture does the rainfall average less than 38 inches annually. That this is considerably above the minimum rainfall requirement of the pineapple has been demonstrated in Hawaii, where production is now carried out on an extensive scale without recourse to irrigation in areas receiving an average annual rainfall of as little as 15 to 20 inches. In semi-arid areas such as these, however, the water collected by the leaves of pineapple plants in the form of dew forms a very important supplementary source of moisture for this crop, and cultural methods have been devised whereby it may be utilized to the fullest possible extent.

Influence of Seasonal Distribution of Rainfall along the Queensland Coast.

Although lack of rainfall, or irregularity in its distribution, do not limit the distribution of the pineapple as a field crop in Queensland, these factors may have a very considerable influence on the yields which are obtained. In all districts the influence will be much more marked in some seasons than in others. The entire eastern seaboard of Queensland has a type of rainfall distribution characterised by a rainy summer and a dry winter. The annual total varies considerably in different districts, as also does its distribution within the broad limits already defined. At Ayr and Bowen almost three-quarters of the total rainfall is received between December and March, inclusive, while in the vicinity of Brisbane only slightly more than half the yearly total is normally recorded during this period. Moreover, at Brisbane the precipitation for the driest month (September) is approximately four times that for the driest month at Ayr (August). These and other features of the rainfall at important pineapple-producing centres along the Queensland coast are summarised in the following table:—

TABLE II.

RAINFALL DATA FOR PINEAPPLE-PRODUCING LOCALITIES IN QUEENSLAND.

Locality.	Average Annual Rainfall.	[Average Rainfall. Dec.-Mar. inclusive.	Percentage of Annual Total.	Wettest Month.	Average Rainfall.	Driest Month.	Average Rainfall.
Brisbane	45·27	23·33	51	Jan.	6·51	Sept.	2·00
Rockhampton ..	39·75	25·08	63	Feb.	7·89	Aug.	·85
Bowen	39·88	29·37	73	Jan.	10·37	Aug.	·66
Ayr	41·76	31·23	75	Jan.	11·50	Aug.	·58

It will be observed that there is a progressive decrease in summer rainfall from north to south, both as regards the proportion of the annual total as well as in actual amount; at the same time, there is a corresponding increase in the amount which falls during the winter months. This means that the districts in the southern part of the State enjoy a better rainfall distribution than those in the north. As far as pineapple-growing is concerned, however, the advantage is more apparent than real because, in southern Queensland, growth of this crop during the winter months is controlled, not by rainfall, but by temperature.

There is, for most plants, a critical period of growth during which weather conditions largely determine the amount of the final yield. In the case of the pineapple, this critical growth period occurs just prior to blossoming. Unfavourable growing conditions during this period will be reflected in a reduction in the number of florets making up the flower spike, which will result in a smaller average fruit size and a consequent decrease in yield. Under Queensland conditions, where there are two peak harvest periods during the year, there are also two critical growth periods, but owing to difference in temperature conditions these are not coincident in the northern and southern parts of the State. At Bowen, for example, they occur during November and May, while in the southern districts January and September are normally the critical months. In these latter districts, therefore, development of the flower buds for the summer crop occurs during the driest period of the year, while those for the winter crop develop in the rainy season. As a result, summer fruit in this region tend to be smaller in size than winter fruit, while, to a lesser extent, the reverse holds true for districts in the northern part of the State where moisture conditions in the soil are generally more favourable for plant growth in May than they are in November. In several northern areas, moreover, particularly the Burdekin delta, a deficiency of soil moisture during dry periods may readily be prevented by irrigation, a practice which can be employed in the southern districts only in isolated instances.

Harmful Effects of Excessive Rainfall.

In southern Queensland, however, heavier losses to the pineapple industry are caused by excessive rather than too little rainfall, particularly when heavy downpours occur during the late summer and autumn months. Apart from the damage resulting from erosion, heavy or poorly-drained soils which become soaked during this period remain in a semi-waterlogged condition until well into the winter, partly because of the decreased rate of evaporation at this time of the year, and partly because the slowing up in the rate of growth which results from the lowering in temperature correspondingly reduces the water requirement of the crop. Soils which contain moisture in excess of their field capacities are, *ipso facto*, poorly aerated, and, as previously pointed out, such a condition, if prolonged, leads to death of roots from asphyxiation, and thus to the subsequent development of wilt symptoms in the leaves.

A definite relationship between rainfall and the incidence of pineapple wilt in southern Queensland would be difficult to establish because of the limited number of recording stations which are located in the pineapple-growing districts. Records reveal, however, that the first general outbreak of pineapple wilt in this region occurred in 1887, a year of excessively high rainfall, and that severe losses from the disease were again experienced in 1890 and 1893, both extremely wet years. This is illustrated by the following table, which shows the rainfall registrations at Brisbane for the years 1887 to 1894 inclusive, together with the average annual rainfall at this station:—

TABLE III.

RAINFALL AT BRISBANE, QUEENSLAND, 1887-94.

Year.	Rainfall. (Inches).
1887	81·54
1888	33·08
1889	49·36
1890	73·02
1891	41·68
1892	64·98
1893	88·26
1894	44·02
Annual average	45·27

Thus, in the years that pineapple wilt was prevalent in the Brisbane area during the period 1887-94, the rainfall was 36·27, 27·75, and 42·99 inches in excess of the average. Further evidence of the correlation which exists between abnormally high rainfall and the incidence of pineapple wilt is supplied by records from the Palmwoods-Woombye district from 1928 to 1933 (Table IV.). During 1928, and again in 1930-31, exceptionally wet conditions prevailed in this area and wilt became increasingly destructive. By 1931 there were few plantations which had not been affected by the disease. During the following year, however, which was exceptionally dry, further extension of the disease was arrested nor did it reappear in 1933—which was a year of approximately normal rainfall—even in plantations in which previously it had been making rapid headway.

TABLE IV.

RAINFALL AT PALMWOODS, QUEENSLAND, 1928-33.

Year.	Total Rainfall.	Rainfall, January to June (both inclusive).
	(Inches).	(Inches).
1928	92·40	83·68
1929	68·55	49·62
1930	84·43	70·25
1931	88·22	58·69
1932	36·01	21·81
1933	67·91	27·13
Annual average	65·92	45·36

While a relatively light rainfall, provided it is reliable in its incidence, is preferable to a heavy one for pineapple culture, it is not possible to lay down any hard and fast rule regarding the rainfall requirements for specific localities, since the amount of moisture required to maintain favourable moisture conditions in a soil varies considerably not only with the type of soil, but also with the rate at which water is being removed or lost from the zone of root penetration by transpiration and evaporation. Other things being equal, maximum yields can be obtained only when the moisture content of the soil is in excess of the wilting point—though not in excess of field capacity—throughout the whole period of growth. Such ideal moisture conditions are seldom realised in practice, but much can be done to increase the effectiveness of the rainfall which is received by the employment of cultural measures designed to prevent loss of moisture from the soil during dry periods while at the same time providing for the rapid removal of surplus water during wet ones. The practical aspects of moisture conservation and drainage are discussed in a subsequent chapter.

SUNSHINE.

In general, the period over which sunlight is recorded increases as rainfall decreases, though the varying length of day at different seasons of the year is an important factor in this connection, except in regions close to the equator. The amount of sunlight to which pineapple plants are exposed, especially during the ripening period, is often decisive in determining fruit quality, because sunlight is essential for the synthesis of sugar. In southern Queensland the sugar content of fruits which ripen between September and May is considerably higher than it is for the remainder of the year, and this is directly related to the very much shorter day period which obtains during the winter months. Fruits which ripen during prolonged wet or cloudy periods during March and April also tend to have a low sugar content, though this is frequently masked to the palate because of the low acid content which accompanies it. Dense ratoon fields in which desuckering has not been carried out produce fruits which are both small in size and relatively low in sugar because the area of leaf surface which is exposed to sunlight is greatly reduced, owing to the semi-vertical position into which the leaves are crowded. For a similar reason, wider spacing of plants is advocated in cloudy, wet localities than in dry ones. A belt of tall trees bordering on a pineapple plantation cuts down the amount of light available to plants which lie in the path of its shadow. The low productivity of pineapple plants when grown in proximity to citrus, papaw, or other trees is likewise due to shading.

In order that plants on both sides of a double row may receive approximately equivalent amounts of sunlight, it is desirable that the rows should run north and south. Except on level or very gently undulating country, however, the direction in which the rows are laid out is usually dictated by the direction of the slope, since it is more important to ensure adequate drainage than even illumination. Nevertheless, every grower will have observed that where the direction of the rows is east to west, the plants on the southern side are invariably backward in fruiting compared with those on the northern side.

In some countries, particularly in Florida, it was at one time considered that partial shading of pineapple plants was beneficial in that they were better able to withstand dry conditions and were less susceptible to wilt. These views led to the introduction of methods for the cultivation of pineapples under lath houses—so-called "shed culture"—but these methods have since mostly been abandoned. The apparently superior growth which is sometimes made by plants growing in shade is due partly to their reduced moisture requirement—consequent on the slowing up in the transpiration rate under the lower temperature conditions which obtain in shade—and partly on their reduced nitrogen requirement. Provided the supply of moisture and nutrients is maintained at a favourable level, however, full exposure to sunlight can in no sense be considered deleterious to pineapple plants, though in midsummer serious burning of maturing fruit may result from the *heat* of the sun's rays which fall directly on them, particularly on westerly slopes. In southern Queensland, covering of fruit during December and early January for protection against sunburn is a precautionary measure which amply repays for the time and trouble involved. Sunburning of fruit, and measures for protecting against it, are further discussed in the chapter dealing with cultural methods.

WIND.

In pineapple culture, wind is important chiefly because of the conditions of temperature and humidity which accompany it; unless it attains hurricane force it has little effect of itself. Along the Queensland coast winds are moist or dry, according to whether they blow in from the ocean or out from the interior. Of the former, the most important are the moisture-bearing monsoons, because it is from these that the greater part of the summer rainfall is derived. The effect of these monsoonal winds on the rainfall of the coastal districts depends very largely on the height of the nearest mountain ranges and on their distance inland. The wettest part of the Queensland coast is that which lies between Cardwell and Cairns, where the highest mountains in the State are located within a few miles of the sea. South of Cardwell, however, the ranges are both lower in height and further inland, so that there is a correspondingly sharp decrease in the coastal rainfall. This is most marked between Townsville and Bowen; in the latter district, for example, the rainfall is less than 30 per cent. of that at Innisfail, which is located at the foot of the highest part of the coastal range. In southern Queensland, also, the effect of the monsoons on rainfall is greatly influenced by the height and location of the coastal ranges. Palmwoods, at the foot of the Blackall Range, has an average rainfall of 65·92 inches, while Brisbane, in less mountainous country 60 miles to the south, receives an average of only 45·27 inches.

Though the effect of moisture-laden winds in relation to rainfall is naturally more marked on mountain ranges than on small ridges and spurs, localised differences in rainfall arising from differences in aspect may have quite an appreciable influence on the character of native vegetation. In southern Queensland, for example, the occurrence of tropical rain-forest (scrub) is restricted very largely to slopes having a northerly or north-easterly aspect; it does not occur on gently undulating or flat country, such as that between Landsborough and Brisbane, because of the drier conditions which obtain therein owing to the absence of continuous land masses which would intercept the monsoons.

While the monsoons are typically summer winds, those that blow from the interior are most prevalent during late winter and spring.

Consequently, their influence is felt during the coldest and driest period of the year and their net effect is to render still more unfavourable the difficult growing conditions which then obtain. In Queensland, westerly winds are always dry winds, and pineapple plantations which are fully exposed to their influence quickly exhibit symptoms of acute moisture deficiency during dry periods. Moreover, losses from the physiological disease of pineapple fruits known as "black heart" are invariably heavier in locations lacking shelter from westerly winds. In fact, fluctuations in the incidence of this disease in all localities in southern Queensland during late winter and spring are closely correlated with the periodicity of the westerlies.

Care in the selection of the plantation site is the best precautionary measure which can be taken against the damaging effect of westerly winds. In flat, exposed areas, the planting of belts of low-growing trees or shrubs will afford valuable wind protection, but it should be remembered that such breakwinds not only compete with nearby crop plants for soil moisture and nutrients, but that, if unduly high, they may exert a harmful shading effect on an appreciable proportion of the crop, particularly during the winter months. Of the great number of trees and shrubs which may be planted for breakwinds, two of the most satisfactory for southern Queensland conditions are the Portuguese cypress (*Cupressus lusitanica*) and the native coastal cypress (*Callitris arinosa*). Neither of these trees grows to a height of much more than 20 feet and, in addition to being robust in constitution, they are relatively quick-growing and bushy in habit throughout their life.

DEW.

When moist air in contact with the ground is chilled below the point at which it can hold all its moisture in the form of vapour, the surplus moisture is deposited on plants and other objects in the form of dew; or, if the temperature falls below freezing point, in the form of frost. Conditions which favour the formation of heavy dews are, therefore, warm day temperatures, cold nights, and proximity to large bodies of water, so that as the air warms up in the daytime it may be able to take up large quantities of moisture in a gaseous form. In addition, clear skies are necessary for dew formation since clouds reflect back the heat of the earth and thus prevent the ground air from chilling to the temperature necessary for condensation of its moisture. Along the Queensland coast, conditions are most favourable for dew formation during late winter and spring, a period characterised by warm, sunny days and clear cold nights. At Brisbane, for example, the mean maximum temperature from July to September is 72 degrees F., the mean minimum temperature 52 degrees F., and the mean relative humidity 69 per cent. Because of the proximity of the ocean, a relatively high atmospheric humidity is maintained throughout the coastal districts at this time of the year, despite the lack of ground moisture. The fact that conditions are so favourable for dew formation in southern Queensland at a time when the supply of available soil moisture is apt to be deficient is of special significance in relation to pineapple culture in this region, because, as has already been pointed out, the water collected by the leaves of the pineapple plant in the form of dew is of considerable value in maintaining its growth during dry periods.

[TO BE CONTINUED.]

Codling Moth Control.

Report on 1938-39 Investigations.

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FOR a number of years past, codling moth research has aimed, firstly, at limiting the use of lead arsenate in the spray programme in order to minimise both foliage injury and arsenical residue on the fruit; and secondly, at timing cover sprays so that the maximum control will be effected by each application. Since 1936, investigations at Stanthorpe have sought primarily to test the value of white oil and white oil plus nicotine sulphate in various combinations as codling moth cover sprays, and simultaneously to find a suitable basis for the systematic timing of sprays.

The question of timing codling moth sprays is of particular interest, and in recent years has become one of major importance to apple and pear growers. Very effective control has been obtained in Victoria from spray applications timed according to moth activity as indicated by lure traps (Anon., 1938; Pescott and Miller, 1937). Attacking the insect just after the activity of adult moths has reached a peak seems to be the most logical method of rendering ovicidal and larvicidal cover sprays fully effective, for a maximum number of eggs have then been deposited and are about to hatch.

Accordingly, in the Stanthorpe investigations much attention has been focussed on the timing aspect of the control problem. It has now become apparent that the flight of adult moths is usually an indication of egglaying activity, and it has been repeatedly demonstrated that the flight and abundance of moths can be accurately gauged from continuous records of the numbers of moths caught in lure traps. An abundance of moths on the wing, however, is not necessarily followed by an immediate heavy deposition of eggs, because reproduction and other activities are influenced by weather conditions, particularly by temperature. For this reason, the timing of codling moth sprays cannot be reduced to a simple formula, but must be guided to some extent by a consideration of climatic conditions operating at and shortly after a peak of moth activity.

In 1938-39, the main experimental aims were, firstly, to determine the relative value of various combinations of white oil and nicotine sulphate when employed as cover sprays, and to compare them with the commonly used cover sprays, white oil and lead arsenate; secondly, to study the control value of the different sprays when applied according to three different timing schedules; and thirdly, to study adult moth activity at a number of centres in the district. The work was essentially a continuation of that carried out in the preceding season and which has already been reported (Ward and Ross, 1938).

ORCHARD SPRAY TRIAL.

The orchard spray trial was designed to provide, in the one block of trees, a comparison between different spray mixtures and between different spray timing schedules. The trial was laid down at The

Summit on the block of nineteen-year-old Granny Smith trees used in 1937-38. In general, the experimental methods employed were similar to those of the previous year, but information gained in the past led to an improvement in the design of the experiment, a factorial design in which six spray mixtures were applied under three different timing schedules being used. There were, therefore, eighteen treatments and each of them was replicated six times on two-tree plots arranged in six randomised blocks. Three unsprayed plots were left in each block so that the severity of the infestation could be gauged and the controlling effects of the sprays demonstrated. The experiment involved the treatment of 252 trees during a period extending from mid-October, 1938, to late February, 1939.

During the 1938-39 season, codling moth was unusually active in the Stanthorpe district and gave rise to severe infestation in the majority of apple orchards. In the experimental block there were eighteen unsprayed plots in which the activities of the insect were entirely unchecked, and a further thirty-six plots, those sprayed at five-week intervals, in which control was poor. The presence of these plots kept the moth population in the block at a high level and in consequence the various spray treatments were tested under very severe conditions of infestation.

Spray Treatments.

Since the primary object of the spraying experiment was to study cover sprays, all of the experimental trees, controls excepted, first received a calyx spray consisting of 2½ lb. of lead arsenate powder and ¾ lb. casein spreader in 80 gallons of water. Subsequently the cover spray treatments were as follows, the quantities given being made up to 80 gallons with water:—

(A) White oil, 1⅓ gallons.
(B) White oil, 1 gallon, plus nicotine sulphate, ¼ pint.
(C) White oil, ½ gallon, plus nicotine sulphate, ½ pint.
(D) White oil, ¼ gallon, plus nicotine sulphate, 1 pint.
(E) White oil, 1⅓ gallons, plus nicotine sulphate, 1 pint.
(F) Lead arsenate powder, 2½ lb., plus casein spreader, ¾ lb.

The sprays were applied under the following three timing schedules:—

I. According to moth activity as shown by lure traps.
II. At intervals of three weeks as from date of calyx spray.
III. At intervals of five weeks as from date of calyx spray.

Weather conditions prevented a rigid adherence to these schedules and the actual dates of spray application were as follows:—

Calyx spray—14th October.

Sprays timed according to moth activity—31st October, 14th November, 5th January, 18th January, 25th January, 20th February.

Three-weekly sprays—4th November, 28th November, 16th December, 6th January, 25th January, 20th February.

Five-weekly sprays—14th November, 19th December, 25th January, 20th February.

The final spray on 20th February was required by schedules I. and II. but was also applied to schedule III. and control plots in order to obviate further losses to the grower. Differences in final yields of sound fruit are, therefore, attributable to cover spray treatments prior to 20th February. Harvesting began on 14th February and was completed on 20th March.

Assessment of Results.

The fruit harvested from the experimental trees was classified into three groups—namely (i.), sound, i.e., uninfested; (ii.), infested—calyx entrance; and (iii.), infested—side entrance; fruit which showed slight surface injury (i.e., "stung" fruit) without having actually been entered by a larva was classified as "infested." Thus, in classifying the fruit, export standards were adopted with respect to codling moth injury, which meant that "stung" fruit was rejected although it may have been suitable for local markets. Similarly, classified records were obtained of all windfall fruit.

A total of 184,000 apples, including windfalls, was examined, and of these, 168,000 apples or approximately 1,120 cases, were harvested from the experimental trees. When the data obtained in this experiment were statistically analysed it was found that exactly the same significant differences between treatments showed up when the analyses were based on the total fruit, i.e., harvested fruit plus windfalls, as when based on the harvested fruit only. For this reason the tabulated results which are presented below refer only to the harvested fruit.

Relative Efficiency of the Sprays.

The relative efficiency of the different sprays in controlling codling moth is summarised in Table I., where differences between treatments are not significant unless they equal or exceed 4·3.

The first point of importance which arises from the figures is that five of the six spray mixtures exerted a comparable controlling effect on the insect—i.e., differences in yield of sound fruit given by treatments A, B, C, D, and F were not statistically significant. From this it follows that reductions in the strength of the white oil from 1⅓ gallons to ¼ gallon in 80 gallons, accompanied by increases in the quantity of nicotine sulphate in the mixtures, did not cause any loss of efficiency to the spray. The figures also show that all of the while oil-nicotine sulphate combinations and white oil alone were at least as effective as lead arsenate used alone throughout the season. The 1937-38 spray trial had indicated that a white oil-nicotine sulphate spray, in which the quantity of white oil had been reduced to ¼ gallon and combined with 1 pint of nicotine sulphate, was as effective as the other sprays tested. The 1938-39 experiment confirmed this observation, for this spray (treatment D) again proved as efficient as the other sprays tested, with the exception of the full-strength white oil-nicotine sulphate mixture (treatment E) which in 1938-39 gave definitely better results than any other spray. Trees sprayed with this full-strength mixture yielded an average of 10 per cent. more sound fruit than those receiving other treatments. This increase can be attributed to the presence of the nicotine sulphate in the mixture, since treatment A, in which white oil was used alone at a strength of 1⅓ gallons in 80, was definitely inferior to treatment E.

TABLE I.

RELATIVE EFFICIENCY OF SIX COVER SPRAY TREATMENTS. BASED ON THE MEANS FOR ALL TIMING SCHEDULES.

Treatment.	Mean per cent. Sound Harvested Fruit.
(A) White oil (1⅓ gallon-80 gallons)	73·2
(B) White oil, plus nicotine sulphate (1 gallon-¼ pint-80 gallons) ..	74·3
(C) White oil, plus nicotine sulphate (½ gallon-½ pint-80 gallons) ..	70·7
(D) White oil, plus nicotine sulphate (¼ gallon-1 pint-80 gallons) ..	72·8
(E) White oil, plus nicotine sulphate (1⅓ gallon-1 pint-80 gallons) ..	83·0
(F) Lead arsenate powder (2½ lb.-80 gallons, plus ¾ lb. casein spreader)	74·8
Unsprayed plots	41·5

Standard Error = 1·53 = 2·05 per cent. of General Mean
Significant Difference = 4·3
F value = 7·74, which is highly significant.

More detailed figures showing the effectiveness of the six different cover sprays under each of the three timing schedules are presented in Table II. The main differences between spray treatments show up in all timing schedules and are similar to those in Table I.—viz. (*a*), treatment E was outstanding, and (*b*), other white oil-nicotine sulphate sprays have much the same insecticidal value as lead arsenate in codling moth control. The low yield of sound fruit in treatment C under schedule I. is clearly an anomaly of no real significance; otherwise, comparable yields would have been apparent with the same spray in other timing schedules. Since the white oil spray and the white oil-nicotine sulphate combinations were as effective as lead arsenate in all three timing schedules, it would appear either that lead arsenate was not effective for a longer period than the other sprays, because of its removal by foliage rubbing, growth of fruit, &c., or that greater egg and/or larval mortality immediately following the application of the non-arsenical sprays compensated for any greater durability in the toxic action of the lead arsenate.

One of the principal points which emerges from the results presented in Tables I. and II. is that the white oil and white oil-nicotine sulphate sprays compare favourably with lead arsenate, and the experiment has, therefore, demonstrated once again that these sprays form reliable substitutes for lead arsenate in cover sprays used against codling moth.

Effect of Timing Spray Applications.

In timing schedules I. and II. six cover sprays were applied, and in schedule III. the trees received four such sprays. The relationship between codling moth activity and the dates of application of the sprays under each schedule is shown in Plate 3, A.

Data which indicate the efficiency of the sprays under the three timing schedules are given in Table II., and a summary of them appears in Table III. No significant difference is apparent between schedules

I. and II., but with schedule III. results were definitely inferior to those obtained under the other two schedules. Obviously, under this latter schedule the sprays gave a markedly inferior control of the insect. A comparison of the percentage sound fruit from timing schedules I. and II. would seem to indicate that sprays applied according to moth activity had no advantage over those applied regularly at three-week intervals. However, four of the six cover sprays which were applied at three-week intervals fell due shortly after peaks of moth activity (Plate 3, A) and would, therefore, be as effective as the corresponding sprays timed by lures. This unusual circumstance would, undoubtedly, mask even considerable differences in the efficiency of these two schedules such as might otherwise have occurred.

TABLE II.

SUMMARY OF RESULTS GIVEN BY THE SIX SPRAY TREATMENTS UNDER THREE DIFFERENT TIMING SCHEDULES.

Spray Treatments.	Mean Per Cent. of Sound Fruit.		
	Timing Schedules.		
	I.	II.	III.
A	79·7	73·2	66·6
B	80·9	77·9	64·0
C	71·5	74·4	66·2
D	76·8	74·4	67·5
E	88·7	85·3	75·0
F	81·4	77·3	65·7

Unsprayed plots = 41·5.

Standard Error = 2·65.
Significant Difference = 7·47.

TABLE III.

MEAN PERCENTAGES OF SOUND FRUIT OBTAINED UNDER THREE TIMING SCHEDULES. BASED ON MEANS FROM THIRTY-SIX PLOTS.

Timing Schedule.	Mean Per cent. Sound Fruit.
(I) according to moth activity	79·8
(II) at three weekly intervals	77·1
(III) at five weekly intervals	67·5

Standard Error = 1·08.
Significant Difference = 3·05.
F value = 35·50, which is highly significant.

Although statistical significance was not obtained, it will be gathered (Table II.) that spray treatments applied under timing schedule I. showed a general tendency to give better control than the same sprays applied in accordance with schedule II., and this tendency is opposed only in the case of treatment C. A detailed examination of the experimental data showed that if treatment C were omitted from the analysis a significance between the two schedules could be proved, but such a procedure is not admissible on statistical grounds. Though the experiment has not proved conclusively that timed sprays give more satisfactory control of codling moth than sprays applied at three-week intervals, it does suggest, however, that under circumstances in which three-week sprays did not happen so often to fall at appropriate times, the better results obtained under the lure-timed schedule would be clearly marked.

Calyx Infestation.

The amount of calyx infestation in plots which received lead arsenate cover sprays was significantly less than that which occurred in plots sprayed with white oil or white oil and nicotine sulphate (Table IV.). It would appear, therefore, that lead arsenate is more effective than the other materials in preventing calyx entrances, but may be less effective in preventing side entrances. Another significant difference is that white oil alone (treatment A) was less effective in controlling calyx infestation than two of the white oil-nicotine sulphate mixtures (treatments D and E). In general, these results further show that approximately 20 per cent. of the infestation took place through the calyx of the fruit. In the control plots, which received no calyx spray, 40 per cent. of the infestation took place through the calyx. This point clearly demonstrates the value of the calyx spray.

Arsenical Spray Injury.

All plots that received lead arsenate in both calyx and cover sprays showed extensive foliage injury, which took the form of dark-brown,

TABLE IV.

INFLUENCE OF VARIOUS SPRAY TREATMENTS ON CALYX INFESTATION.

Treatment.	Mean Per Cent. Calyx Entrances in Infested Fruit.	Mean Per cent. Side Entrances in Infested Fruit.
A	22·0	78·0
B	20·5	79·5
C	20·4	79·6
D	18·1	81·9
E	18·9	81·1
F	14·5	85·5
Control plots	40·2	59·8

Standard Error = 1·07 = 5·59 per cent. of General Mean.
Significant Difference = 3·0.
F value = 6·00, which is highly significant.

irregular, dead blotches on the leaves, and of marginal scorching. Plots that had received lead arsenate only in the calyx spray showed some injurious effects, but these were confined to older foliage, such as that which occurs towards the basal part of current season's shoots. These plots carried a relatively high proportion of normal foliage, and they therefore demonstrated that a marked reduction in leaf blotch and leaf scorch occurred when lead arsenate was not employed in cover sprays. The best foliage was produced on the control trees, which had not received any lead arsenate sprays.

SPRAY TESTS AGAINST CODLING MOTH EGGS.

Tests against codling moth eggs were made with the object of determining the ovicidal value of sprays employed in the 1938-39 field experiment, and of other sprays which are used in orchard practice or which have been suggested as being suitable for use against codling moth. Twelve spray mixtures were tested.

Experimental Technique.

To secure large stocks of eggs for the tests, numerous adult moths were induced to deposit eggs on apple twigs placed in oviposition cages. About fifty moths taken from stocks of the insect which had overwintered in the larval stage were maintained in each cage. About 800 eggs were required for each series of tests, and as soon as sufficient twigs bearing this number became available they were grouped in thirteen batches, each containing an approximately equal number of eggs; twelve different spray treatments were then applied, one treatment to each batch, and one batch being left unsprayed. The age of the eggs at the time of treatment was not less than two days and not more than six, and none of them had reached the "black spot" stage, i.e., the stage immediately preceding hatching. The number of eggs not hatching under each treatment was determined by making periodical examinations under a binocular microscope. Each series of tests was repeated eight times between October and early December, the same procedure being adopted on all occasions.

Results.

A summary of the tests is presented in Table V. Of the materials used, white oil was the only insecticide that possessed marked toxic properties against the eggs of the insect. A reduction in the strength of the oil sprays tended to result in a slightly lower mortality (cf. treatments 3 and 4 with 1, 2, 5, and 6), but this decrease in mortality was not significant. The combination of nicotine sulphate with white oil was no more effective than white oil alone, although nicotine sulphate itself is shown to possess weak ovicidal properties (cf. treatment 7 with control 13).

With the exception of lead arsenate, which, of course, was entirely ineffective, the remaining sprays failed to destroy more than a low percentage of the eggs. The test, therefore, has demonstrated that these spray mixtures are of little or no practical value as ovicides against codling moth. The colloidal sulphur plus nicotine sulphate and the potash soap sprays have failed to control codling moth in earlier field experiments, and as they are only very weak ovicides it would seem that these two sprays are unable to act effectively against any stage of the insect.

TABLE V.

EFFECTS OF SPRAY MIXTURES AGAINST CODLING MOTH EGGS. MEANS OF EIGHT SEPARATE TESTS.

Treatment.	No. of Eggs Treated.	Per Cent. of Eggs not Hatching.	Significantly Exceeds.
(1) White oil (1⅓ gallons in 80 gallons)	378	95·0	7, 8, 9, 10, 11, 12, 13
(2) White oil-nicotine sulphate (1 gallon-¼ pint-80 gallons)	396	94·0	7, 8, 9, 10, 11, 12, 13
(3) White oil-nicotine sulphate (½ gallon-½ pint-80 gallons)	463	92·4	7, 8, 9, 10, 11, 12, 13
(4) White oil-nicotine sulphate (¼ gallon-1 pint-80 gallons)	384	90·2	7, 8, 9, 10, 11, 12, 13
(5) White oil-nicotine sulphate (1⅓ gallon-1 pint-80 gallons)	460	97·0	7, 8, 9, 10, 11, 12, 13
(6) White oil-nicotine sulphate (1 gallon-1 pint-80 gallons)	497	98·1	7, 8, 9, 10, 11, 12, 13
(7) Nicotine sulphate (1 pint-80 gallons)	452	39·1	11, 12, 13
(8) Lime sulphur-nicotine sulphate (1 gallon-1 pint-80 gallons)	406	36·1	11, 12, 13
(9) Colloidal sulphur-nicotine sulphate (2½ lb. -1 pint-80 gallons)	477	32·9	12, 13
(10) Potash soap (20 lb.-80 gallons)	576	41·7	11, 12, 13
(11) Potash soap-nicotine sulphate (5 lb.-1 pint-80 gallons)	700	24·6	12, 13
(12) Lead arsenate (2½ lb.-80 gallons)	397	5·0	
(13) Control (untreated)	501	4·7	

S.E. (of square roots of mortality percentages) = 0·35 = 4·81 per cent. of G.M.
F value for treatments = 66·2, which is highly significant.

In the 1938-39 orchard experiment a spray consisting of one pint of nicotine sulphate and 1⅓ gallons of white oil in 80 gallons of water, (treatment E, Table I.) gave definitely better control than a spray consisting of white oil only used at a strength of 1⅓ gallons in 80 (treatment A, Table I.). In view of the fact that, in the ovicide tests, nicotine sulphate did not increase the egg-killing value of the white oil, it would appear that the nicotine sulphate used in the field experiment acted on some stage of the insect other than the egg. There are four potential modes of action of nicotine sulphate in the field—

(*a*) The destruction of adult moths present in the trees at the time of spraying;

(*b*) The prevention of oviposition, perhaps during a brief period only, by a repellant action of the spray;

(*c*) The destruction of newly-hatched larvæ which might be exposed on the trees at the time of spraying, or which might hatch soon after spraying; and

(*d*) The destruction of eggs which are about to hatch when the sprays are applied.

Any one or more of these modes of action may be operative. Hough (1938) has shown that free nicotine compounds, such as nicotine sulphate, kill adult moths in the orchard, but there is little experimental evidence suggesting any prolonged repellant action in nicotine sprays.

In Victoria, however, nicotine sulphate used alone or combined with white oil has proved very effective in killing newly-hatched codling moth larvæ (Pescott, 1939). Finally, in America, nicotine sulphate alone killed a high percentage of those eggs which were due to hatch within twenty-four hours of being sprayed, but its effectiveness rapidly decreased when the eggs were more than one day from their normal time of hatching when sprayed (Hough, 1938). This American observation is in agreement with the results recorded above. A considerable amount of evidence has accumulated, therefore, to show that although nicotine sulphate is not of great practical value as an ovicide against codling moth eggs, it has a more toxic effect upon some other stages of the insect.

CODLING MOTH ACTIVITY DURING 1938-39.

Method of Study.

The activity of adult moths throughout the season was observed at the site of the orchard spraying experiment and at four other widely-separated centres in the Stanthorpe district—namely, Broadwater, Bapaume, Eukey, and Glen Aplin. In an apple orchard at each centre twenty glass lure traps containing one part of light wine in nine parts of water were examined twice each week. The number of moths collected was then recorded. The traps were recharged with fresh lure material at fortnightly intervals, and water was added on alternate weeks to offset evaporation. Daily minimum and maximum temperature records were kept by the orchardists on whose property the traps were located.

Moth Activity at The Summit.

In the 1938-39 season the moths began to appear early in October, and the main activity of the spring brood occurred between mid-October and early November (Plate 3, A). Thereafter, until late December, the moths were much less abundant. At the end of December, the activity of the summer brood—the progeny of those moths which were active in the October-November period—had commenced. In the ensuing two months this activity was marked by the occurrence of a number of distinct peaks in the graph record, and after the end of February the moths became very scarce.

A striking and unusual feature of the moths' behaviour is reflected in the occurrence of well-defined twin peaks of activity in October, January, and February. The October peaks occurred during the mass emergence of the spring brood. The first of the two peaks was reached on 24th October, and was at once followed by a rapid decline. Temperature records for the six days preceding 24th October show that conditions were then favourable for emergence, the weather being warm, with daily maxima reaching 82 deg. F., but the next few days were relatively cold, with maxima ranging from 60 deg. to 70 deg. F., and also rainy, 1 inch of rain having fallen. During this period temperatures, at dusk, when flight and egg-laying are usually at a maximum, ranged from 55 deg. to 60 deg. F. These conditions were unfavourable for the activity of those moths which had already emerged and probably delayed the emergence of further moths. Under the influence of rising temperatures a few days later the moths again became active, and trap collections showed a sharp rise to form the second of the twin peaks on 31st October. In the experimental spray plots, two timed cover sprays were required to cope with each of the twin peaks (Plate 3, A).

During a period extending from mid-November to early January, no timed cover sprays were applied, but under the three-week timing schedule the experimental trees involved received two cover sprays in this period (Plate 3, A). The small peak in late December and the twin peaks in January were dealt with in timed sprays applied on 5th, 18th, and 25th January. In February, two more peaks developed, and under the circumstances a single-timed spray was considered adequate to control the insect at this stage. By 15th February harvesting was in progress, and on 20th February a final cover spray was applied to all the plots to check further infestation of fruit still unpicked.

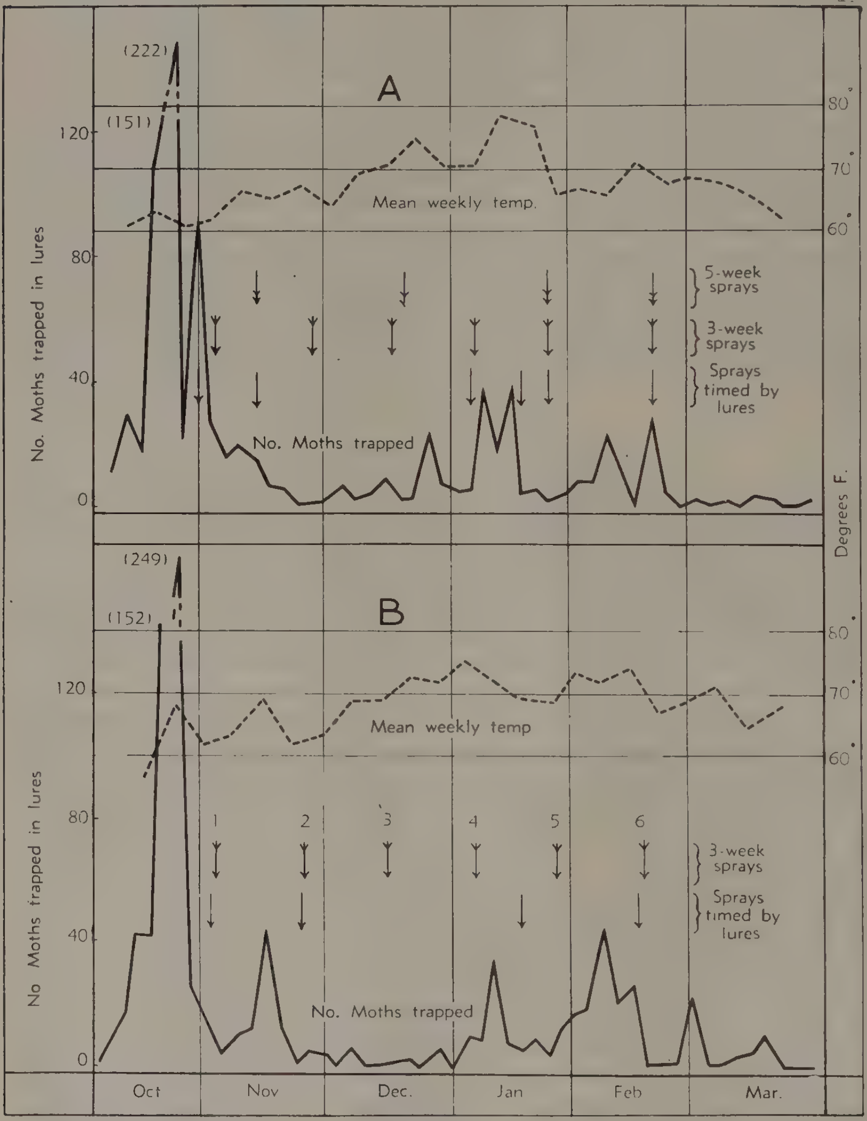

Plate 3.

SHOWING CODLING MOTH ACTIVITY AND MEAN WEEKLY TEMPERATURE AT THE SUMMIT: A—IN 1938-39; B—IN 1937-38.

Spraying requirements in lure-timed and three-week schedules at The Summit in 1937-38 and 1938-39 indicate one of the more obvious advantages of timing cover sprays according to trap records (Plate 3, cf. A and B). In 1938-39, four of the six three-week sprays were applied within periods when timed cover sprays were also due. If the same two systems of timing had been employed in the previous season, three of the three-week sprays (the 1st, 2nd, and 6th) would have fallen on about the same dates as timed sprays, but two of the former sprays (3rd and 4th) would have been applied unnecessarily in view of the relative inactivity of the moth at that time, and one of them (the 5th) would have been applied too late to act effectively against the peak which occurred in January. Further, in 1937-38, only four lure-timed cover sprays were required to control the pest on late varieties of apples, whereas six sprays were required by a three-week schedule.

These graphs also show that codling moth activity in the two seasons differed considerably, and the control problem was therefore different in each season. In 1938-39, control was complicated by the occurrence of double peaks of activity three times during the season, and this necessitated a greater number of cover sprays than in the previous season. The times of application of the sprays in the two seasons also differed in a marked degree.

The optimum times for applying codling moth sprays in any particular year thus bear little or no relation to the times of spraying in other years. Beneficial results from the timing of cover sprays should be most noticeable in a season when the insect is unusually abundant and difficult to control.

It follows from the above evidence that by studying moth activity during the season it is possible, on the one hand, to dispense with unnecessary sprays, and, on the other, to intensify control measures when circumstances so demand.

Moth Activity at Other Centres in the District.

Moth activity at all observation stations is summarised in Plate 4. The curves of moth activity show that the major peaks in October and January occurred on the same dates at all stations, Glen Aplin partly excepted, and in each case double peaks developed simultaneously. This point demonstrates a general similarity in the behaviour of the moths at five centres, and at the same time shows the sensitiveness of the lures. The graphs differ, however, with respect to minor peaks. At The Summit and Bapaume the moths showed little activity between mid-November and January, and no cover sprays were required at the two centres during that time. At Eukey, Broadwater, and Glen Aplin, however, there were, between the same dates, sufficient moths present to warrant the application of one or two precautionary sprays. The Glen Aplin graph shows some rather abnormal features. At that centre the spring mass emergence of moths was not as clearly marked as at others, and no prolonged period of relative inactivity occurred between the emergence of first and second brood moths, and second brood peaks were not very distinct. The double January peaks were less marked at Glen Aplin than they were at the other centres. In seasons and localities where the Glen Aplin type of moth behaviour is recorded the timing of some of the cover sprays may be difficult, and, therefore, it may be as satisfactory to apply later cover

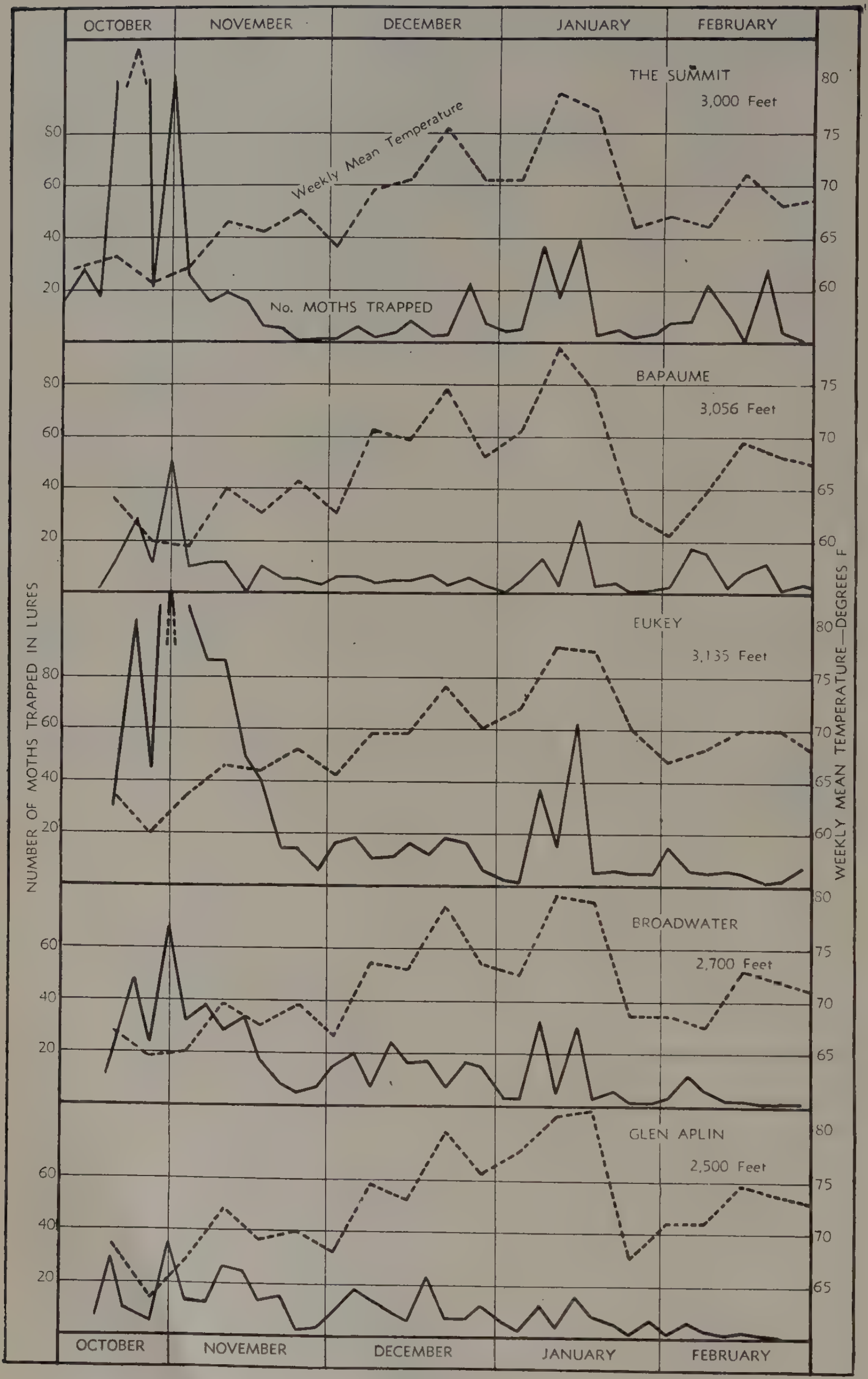

Plate 4.

CODLING MOTH ACTIVITY AND WEEKLY MEAN TEMPERATURES AT VARIOUS CENTRES IN THE STANTHORPE DISTRICT DURING 1938-39.

sprays at, say, three-week intervals as to time them by lure-traps records; but the early cover sprays to control the spring brood could, no doubt, be timed according to moth activity.

Similar temperature changes occurred simultaneously throughout the district, and, in general, these changes influenced codling moth activity in much the same way. Thus, a temporary drop in temperature in October was responsible for an interruption in moth activity at all centres, whilst hot weather in January appears to have caused another temporary setback in activity; in both cases the temperature change was marked by the development of twin peaks. Between 11th January and 17th January temperature maxima ranged from 98 deg. F. at Bapaume to 103 deg. at Glen Aplin, and the Stanthorpe maximum record was broken at 102 deg. These high temperatures merely interrupted moth activity, as trap collections increased again immediately afterwards. It seems probable that egg-laying was also greatly reduced, as excessively high temperatures are known to prevent reproduction (Isley, 1938). This latter fact may account, in part, at least for the virtual cessation of moth activity after February (trap collections continued until the end of March).

Whilst the graphs show that, in general, temperature changes occurred simultaneously throughout the district, it is also apparent that some centres consistently recorded higher temperature than others. Relative differences in temperature at the different centres are indicated by the following average maximum and minimum temperatures based on daily records for the October-March period, 1939:—The Summit, 85 deg. and 52 deg. F.; Bapaume, 82 deg. and 54 deg. F.; Eukey, 85 deg. and 54 deg. F.; Broadwater, 89 deg. and 55 deg. F.; Glen Aplin, 93 deg. and 52 deg. F.

From the above observations, the general conclusion can be drawn that, although codling moth activity at various centres is comparable during spring and summer bursts of activity, the moths may be relatively more abundant in some localities than in others between the peaks arising from the spring and summer broods (cf. The Summit and Bapaume graphs with those of Broadwater and Glen Aplin). This difference in moth behaviour, whilst not strikingly marked, may sometimes necessitate the adoption of slightly modified spray programmes in some localities. Hence, if district-wide recommendations on the timing of cover sprays are based on lure trap records taken at one or two observing stations only, better control is likely to be obtained in some parts of the district than in others. It seems, therefore, that such recommendations must be based on observations made in several localities, and especially in localities which tend to differ from each other topographically and climatically. Obviously, cover sprays could be most successfully timed if observations on moth activity within individual orchards or within a group of orchards in the same locality were available.

LIFE HISTORY OBSERVATIONS.

General observations on the life history of the codling moth were made in the Stanthorpe insectary during 1937-38 and 1938-39, when the insect was reared by the usual methods, and records were kept of the life cycle of a number of individuals. In 1938-39, the observations were based on a single generation reared between October and January.

The data gathered during the two seasons mentioned can be summarised as follows:—

	Days.
Preoviposition period	4·4
Oviposition period	11
Total egg stage	9
Larval feeding stage	22
Cocooning to pupation	8
Pupation to emergence	15
Total cocoon period	23
Egg to adult	54

These figures represent the time required for the majority of the insects in the spring brood to pass through each stage, but there are always some individuals which take a shorter or longer period than that shown above. Thus, the time which elapsed between the emergence of female moths and the commencement of egg-laying varied from one to seven days; the length of time the larva was in an apple varied from fourteen to twenty-five days; and the cocoon stage ranged from twelve to twenty-nine days. The periods given above are liable to vary, also, during the season, being a little longer in spring, when development is slightly retarded, and a little shorter in the summer months, when it is slightly hastened.

SOME ASPECTS OF CODLING MOTH RESEARCH ELSEWHERE.

The search for suitable substitutes for lead arsenate in the codling moth spray programme has been rendered necessary by three important factors:—

(*a*) The foliage injury which arises so frequently on trees sprayed with lead arsenate;

(*b*) The difficulty of complying with legislation which requires that fruit for human consumption must not contain more than $\frac{1}{100}$ grain of arsenic trioxide equivalent per pound; and

(*c*) The desirability of obtaining an improvement in control over that usually given by lead arsenate.

Research on these questions in various parts of the world has covered a very wide field. The investigation of other stomach poisons, such as calcium, zinc and manganese arsenates, has not so far led to the finding of a substitute which has conclusively been shown to be more satisfactory than lead arsenate. Efforts to render the lead compound itself more effective by improving the spreading and sticking qualities of the spray mixture has resulted in a tendency for lime-casein spreaders to be replaced by other materials which allow less run-off and thus enable a thicker film of poison to be deposited. In this connection, the use of a small quantity of white oil in lead arsenate sprays has become a common practice in many apple areas. Experiments in Victoria in 1936-37 indicated that better control resulted when one pint of white oil was incorporated as a spreader or sticker in lead arsenate sprays than when 1 lb. of calcium caseinate was used (Pescott and Miller, 1937).

Attempts have also been made to discover whether any relationship existed between the size of the poison particles in lead arsenate and its toxic value. Work of this nature has been undertaken because it was thought that possibly commercial lead arsenates contained too high a proportion of large-size particles and, on this account, minute newly-hatched codling moth larvæ might be unable to ingest a sufficiently large dose of the poison. This theory, however, seems to have received no support from experimental evidence. Thus, American laboratory tests have shown that medium-grained fractions of lead arsenate, somewhat coarser than those which normally exist in the commercial material, tended to be slightly more effective than fine fractions, though particles too large to be ingested were obviously of no value (Siegler and Goodhue, 1939). In a Victorian orchard spraying trial, in which colloidal lead arsenate was compared with ordinary lead arsenate paste, the colloidal material gave a markedly inferior control (Pescott, 1936, 1938). It seems therefore that experimental work in this particular direction offers little prospect of an improvement in lead arsenate sprays.

Attempts to discover effective non-arsenical cover sprays for use in the codling moth programme have, on the other hand, met with a considerable amount of success. The insect could often be controlled by sprays which acted primarily against the egg stage, and in this connection white oil emulsions assumed an important rôle. In America, where conditions of infestation necessitate heavy and frequent spray applications, white oil with a high viscosity caused foliage and fruit injury, but this defect could be largely overcome by using oils with a lower viscosity and limiting the amount of oil in the spray mixture (Driggers, 1937). In a large-scale experiment in New Jersey, white oil was applied to apple trees for a period of five years without injuring the trees (Driggers, 1937). White oil has also been used in Australia for a number of years without injuring the foliage and fruit of most commercial varieties of apples.

In recent years much attention has been given to the question of combination sprays for use against codling moth, and white oil has again taken a prominent part. The well-known combination of lead arsenate and white oil has led to a definite improvement in control, but if the mixture is employed in cover sprays, particularly late cover sprays, a heavy arsenical residue remains on the fruit at harvest. A means of obviating this difficulty promised to become available when the value of nicotine as a constituent in codling moth sprays was discovered. Numerous experiments have shown that certain nicotine compounds, when combined with white oil, are satisfactory substitutes for lead arsenate.

A combination spray containing white oil and nicotine sulphate was reported as reliable and efficient (Driggers and Pepper, 1934; Harman and Moore, 1938), and proved more effective than one in which white oil was used alone (Harman and Moore, 1938; Hutson *et al.*, 1938). The addition of nicotine sulphate to both lead arsenate and lead arsenate plus oil sprays has also led to a marked improvement in control (Driggers and O'Neill, 1939). Nicotine compounds have, in American experiments, given good control when combined with bentonite or bentonite sulphur, which "fix" the nicotine so that greater quantities of it are retained on the foliage, and remain active for a greater length of time than ordinary nicotine sulphate (Driggers, 1936). Mixtures of bentonite and nicotine sulphate prepared in the spray tank, i.e., tank-mixed, although giving good control of codling moth, cannot be used in practice because of a heavy and persistent residue which such sprays leave on the fruit (Hutson *et al.*, 1938; Jarvis, 1937). The addition of an oil to the above mixture renders the residue less persistent and easier to remove; a satisfactory spray formula contained nicotine sulphate, bentonite sulphur, soya bean oil, and sodium lauryl sulphate (Steiner and Sazama, 1938). Steiner and Sazama's experiments also indicated that the nicotine-bentonite mixture remained effective after heavy rain, and that the use of white oil-nicotine sulphate after earlier nicotine-bentonite sprays minimised the bentonite deposit without causing any loss in efficiency. A proprietary nicotine-bentonite mixture has received attention in a number of experiments in America. The material possesses larvicidal properties, and gives a degree of control which is comparable with that given by lead arsenate. It leaves only a slight, easily removable deposit on the fruit, and is more effective when combined with white oil or with white oil plus nicotine sulphate than when used alone (Harman and Moore, 1938).

The combination sprays which have been discussed are double- and triple-acting mixtures; each of the component spray materials acts mainly against a different stage of the insect. Sometimes one of the components may act against more than one stage. Lead arsenate is a larvicide and acts as a stomach poison; white oil is primarily an ovicide; nicotine sulphate and bentonite-nicotine affect adult moths, eggs about to hatch, and newly-hatched larvæ, but the latter spray is much the more effective against newly-hatched larvæ.

Another important aspect of control is concerned with the correct timing of spray applications. For many years it has been recognised that distinct broods of codling moth occur during the season, that a peak or peaks of emergence and egg-laying activity occur during the active period of each brood, and that this activity is influenced in a marked degree by climatic conditions. Studies on the behaviour of the insect under different climatic influences have provided information which permits the adjustment of spray treatments to insect activity. Several methods of timing sprays have been investigated in America and elsewhere. The emergence of adult moths in cages placed in apple orchards has supplied data on the length of the emergence period and the dates on which peaks occur (Bieberdorf, 1937). A second method requires the use of the "thermal constant" which expresses the relationship existing between the rate of development of the insect and temperature conditions (Headlee, 1931). Either of these two methods when used alone appears to be unsatisfactory, and as a result of extended investigations in America a more refined method has been devised which combines (i.) the summation of effective degree days* of temperature, (ii.) observations on the emergence of moths in field cages, (iii.) the collection of moths caught in lure traps in commercial orchards (Headlee, 1936). The method is designed, primarily, to enable the date of maximum emergence of moths to be predicted. Australian experience has shown that effective control of codling moth can be achieved by timing sprays according to moth activity as indicated only by lure trap records (Anon., 1938; Pescott and Miller, 1937).

The relation of temperature to egg-laying activities of codling moth has been investigated by Isley (1938) in America. A rise in temperature causes an increase in the number of eggs deposited daily and abnormally rapid egg-laying shortens the life of the moths. Excessively high temperatures, 90 deg. F. and above, repress egg-laying, and may produce sterility in the eggs deposited. Heat waves, even of short duration, tend to prevent newly emerged moths from ever depositing eggs. Short periods of high temperature, however, may not have noticeable effects in the field. Low temperatures, on the other hand, retard egg-laying but prolong the life of the moth, and may cause intermittent egg-laying. The most favourable temperature, for oviposition, is about 80 deg. F., at which the moth may deposit an average of nineteen eggs each day. Under favourable conditions a moth may deposit 146 eggs during its lifetime.

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* The total number of degree days for a given stage of development of an insect is arrived at by taking each day from the commencement to the termination of the stage concerned, and by computing the number of degrees by which each day's mean temperature exceeds that of the threshold of development, and then summing the number of degrees so obtained for the whole period under consideration. (Imms, Recent Advances in Entomology.)

GENERAL DISCUSSION.

Codling moth research at Stanthorpe has now almost entirely achieved its immediate objects. The spraying trials have indicated that lead arsenate can be replaced in cover sprays by other spray mixtures without loss of efficiency in the control programme, and that adult moth activity forms a reliable basis for the effective timing of cover sprays.

Whilst it may still be possible to discover new spray materials which are more toxic to codling moth larvæ than those now available, better control of the insect can unquestionably be obtained in the Stanthorpe district by the thorough application of existing sprays, provided these are properly timed. The theoretical basis for the timing of cover spray applications appears to be sound. If continuous records are kept of the number of moths caught in lure traps, fluctuations in adult moth activity can be determined. These records indicate flying and egg-laying activities of the moths, but are not necessarily records of emergence, for moth activity after emergence may be modified by climatic conditions. Lure traps are sensitive to changes in moth activity brought about either by alterations in the population or by the occurrence of unfavourable weather. A large catch of moths is, in general, indicative of a heavy egg deposition. When the catches increase markedly to a maximum and then quickly decline to relatively low numbers a "peak of activity" can be said to have occurred. If the date of the maximum catch is taken as the starting point, it is possible, by making due allowance for the rate of development of the insect and for weather conditions, to ascertain the period during which the greatest number of unhatched eggs will be present on the trees. The time during which a spray could be most effectively applied is determined in this way.

Experimental evidence gives considerable support to these theoretical considerations. It has shown that—(i.) definite peaks of activity occur; (ii.) moth activity is influenced by weather conditions, and this is an important factor in determining appropriate spraying dates; (iii.) lure traps are sensitive to changes in activity; (iv.) orchard sprays applied strictly in accordance with lure trap records are at least as effective as sprays applied every three weeks, and probably more effective. Direct evidence that a large trap collection of moths is correlated with an ensuing heavy egg deposition is not available, but the indirect evidence is substantial and is supported by the good control obtained in orchards where the timing principle is applied.

The interpretation of lure trap records is not always straightforward, because moth activity is greatly influenced by weather and to a less extent by other variable factors. The timing of sprays by moth activity cannot be carried out with mathematical accuracy, and, therefore, the best time to spray must sometimes be determined by experience of moth behaviour and the conditions under which a spray is required, but a precise knowledge of moth activity and weather conditions is indispensable to the success of the method. In practice, two difficulties may arise. In the first place, it may sometimes be doubtful whether the number of moths trapped at a peak of activity has been sufficiently high to justify a spray application. Under such conditions, the decision to spray or not to spray must rest largely on experience. In past experimental work, cover sprays have usually been applied when the catch at a peak averaged at least one moth per trap. This standard is, of course, purely arbitrary and subject to change as the result of further experience, or of experimental work bearing on this point. The second difficulty arises from the fact that a rather long period of relative inactivity usually occurs between November and January, i.e., between spring and summer brood activity. During this time, which is of six to eight weeks' duration, the moth population is low and slightly fluctuating, though seldom rising at any one time to numbers which call for a spray. According to the lures, a spray might not appear to be required. However, during a period such as this, the cumulative effects of slight moth activity may damage more fruit than is desirable should at least one precautionary spray not be applied.

The replacement of lead arsenate in cover sprays by other spray materials is partly necessitated by the extent of the foliage scorch which develops on apple trees sprayed with lead arsenate. From the experimental evidence there can be little doubt that the widespread leaf scorch noted in recent years is directly attributable to lead arsenate sprays, though it may at times be confused with and accentuated by scorch arising from mineral deficiencies in the soil. The injury causes a considerable reduction in the effective leaf area on the tree, and this must lead to loss of vigour and interference with fruiting capacity. The use of white oil in cover sprays, with or without nicotine sulphate, has greatly reduced the amount of scorch in all experimental plots in recent years and has maintained control of the pest.

The fact that a spray mixture containing ¼ gallon of white oil, 1 pint of nicotine sulphate, and 80 gallons of water has controlled the insect in experimental plots, indicates that the cost of the cover spray can be kept within reasonable bounds. Although this spray is effective against codling moth, it is not likely to control scale insects and red mites satisfactorily, and, therefore, if these latter pests require attention the amount of oil in the mixture should be increased in one or more of the codling moth sprays.

Although the application of efficient sprays at appropriate times is the main factor in the control of codling moth, there are other factors of considerable importance. First among these is the method of application of the sprays. There is very often a tendency on the part of growers to use too little spray material on each tree, or to make the application too hurriedly, and consequently the fruit and foliage on which the eggs are deposited are not adequately covered by the spray. Obviously, no spray can be fully effective unless all parts of the tree are completely covered; the inside of the tree must, therefore, be sprayed as thoroughly as the outside. The efficient application of sprays to trees in foliage can best be obtained by the use of a nozzle and a spray pump pressure which will give a rather coarse driving spray. Another important factor in codling moth control is orchard hygiene which is concerned with tree banding and measures aimed at the destruction of larvæ in fruit cases and packing sheds. Supplementary measures such as these play an important part in preventing the building up of a large moth population, and they must, therefore, be regarded as an essential part of the codling moth control programme.

SPRAY RECOMMENDATIONS.

Substitutes for lead arsenate in cover sprays can now be used with confidence, since, under Stanthorpe conditions, several of the non-arsenical sprays tested will control codling moth at least as well as, and in some cases better than, lead arsenate. The correct application of the most efficient of these sprays implies accurate timing now that extensive observations have shown that cover sprays applied according to moth activity are more advantageous than the application of the same sprays on any other basis.

The following recommendations can therefore be made. The quantities of spray materials given are to be mixed with 80 gallons of water:—

Calyx spray—Lead arsenate, 2½ lb. powder (or 5 lb. paste), plus ¼ gallon of white oil as a spreader.

This spray must be applied before the calyces of the blossoms have closed, as it is primarily designed to cover the walls of the calyx cup with poison and thus to prevent larvæ from gaining entrance to the fruit at this point.

Cover sprays—

(1) White oil, 1⅓ gallons, plus nicotine sulphate, 1 pint, *or*
(2) White oil, ¼ gallon, plus nicotine sulphate, 1 pint, *or*
(3) White oil, 1⅓ gallons.

Of the three alternative cover sprays, the first is the most expensive, but it gives more effective control of codling moth than the other sprays tested, and is also of definite value in checking woolly aphis, red mites, apple leafhoppers, and various scale insects. The second spray is less expensive and is as effective as lead arsenate against codling moth, but will not give as good control of other insects as the first spray. The third mixture is as effective as lead arsenate in suppressing codling moth and will also act against red mites and scale insects.

The desirability of timing cover sprays has already been emphasised. Growers who wish to observe codling moth activity in their own orchards and thereby time cover sprays with the greatest accuracy would find that the maintenance of fifteen or twenty lure traps in two acres of apple trees consumes very little time and is very simply carried out. Provided that conditions are favourable for egg-laying when a peak of activity occurs, cover sprays should be applied not earlier than the *fifth* and seldom later than the *twelfth* day after the recorded peak. Any difficulties experienced in interpreting records obtained from lure traps should be referred to officers of the Department of Agriculture and Stock at Stanthorpe, where general information concerning moth activity and appropriate dates for applying cover sprays will also be available.

SUMMARY.

Codling moth investigations were continued at Stanthorpe in 1938-39, and aimed primarily at testing white oil and nicotine sulphate

in cover sprays, at determining the value of timing cover sprays according to the abundance of adult moths, and at examining the possibility of timing sprays on a district-wide basis.

In a replicated factorial orchard experiment, six spray mixtures were compared under three different timing schedules. The results showed that white oil alone, 1⅓ gallons–80 gallons, and three combinations of white oil and nicotine sulphate, namely, (i.) 1 gallon–¼ pint –80 gallons, (ii.) ½ gallon–½ pint–80 gallons, and (iii.) ¼ gallon –1 pint–80 gallons, gave as effective control as lead arsenate plus spreader. A fourth combination, 1⅓ gallons–1 pint–80 gallons, gave better control than any of the other treatments. The results, generally, supported previous observations and demonstrated that white oil and white oil-nicotine sulphate combinations are safe substitutes for lead arsenate in cover sprays. The non-arsenical cover sprays greatly reduced foliage injury and left no objectional residues on the fruit.

Sprays timed according to moth abundance as indicated by lure traps tended to give better control than those applied every three weeks, though the difference was not statistically significant. Sprays applied every five weeks gave poor control. Four of the six three-week sprays fell due shortly after peaks of moth activity, and would therefore be as efficient as those timed by lure traps. There can be little doubt that had spray dates in these timing schedules been more widely divergent, lure trap timed sprays would have shown up to greater advantage.

Tests of various spray mixtures against codling moth eggs showed that white oil is an excellent ovicide, but nicotine sulphate, lime-sulphur plus nicotine sulphate, potash soap, and other materials are far from efficient for this purpose.

Studies of moth behaviour in the field confirmed the previous observation that well-defined peaks of activity, which are associated with moth abundance, occur during the season. Spray applications can therefore be timed according to insect activity, thus avoiding the unnecessary application of sprays and enabling the intensification of spray measures whenever required. It is shown that dates of spray applications in one year do not necessarily bear any relation to those in any other year.

These studies further showed that major peaks of moth abundance develop simultaneously in all parts of the district, but in some localities the moths were sufficiently abundant in between the major spring and summer peaks to warrant the application of precautionary sprays. Temperature changes tended to occur simultaneously throughout the district, but some centres were consistently warmer than others. It is concluded from this work that a district-wide advisory service on the timing of codling moth sprays is practicable, but would need to be based on observations made at several localities in the district.

Studies on insectary-reared moths supplied data on the rate of development of the different stages of the insect at Stanthorpe.

A review of some recent literature indicates the trend of codling moth work elsewhere, and in general shows that the principal insecticides employed in the control of this insect are lead arsenate, white oil, nicotine sulphate, and nicotine-bentonite preparations.

Spray recommendations are given, and if the sprays are well timed and thoroughly applied they will give satisfactory control of the insect.

ACKNOWLEDGMENTS.

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Producer Gas Units.

(Supplied by the Sub-Department of Forestry, Queensland.)

THE Commonwealth Government has recently examined a number of producers with a view to recommending certain types to the public.

In making their recommendations, the Commonwealth advisors approved only those units manufactured by firms of known experience and efficiency. It is quite possible that other lower-priced units may have satisfactory efficiency. Such manufacturers have been invited to submit their units for official test. Upon satisfactory completion of such tests by Government technicians, their names will be added to the approved list.

The manufacturers in the various States whose units have been approved are given in the list below:—

	£	*s.*	*d.*	
(1) Powell Gas Producer Ltd. ..	62	10	0,	f.o.b. Sydney, plus £10 fitting.
(2) Crewe (W. Aust.)	58	16	0,	plus £5 17s. 9d. fitting.
(3) Malcom Moore (Vic., Tas.)	73	0	0,	plus fitting.
(4) Wishart and Co. (Vic.) ..	85	6	3,	plus £4 19s. 6d. fitting.
(5) Fleet Forge (S.A.)	67	12	5,	plus £14 14s. fitting.
(6) Carbo-Gen Gas Co. (N.S.W.)	60	4	9,	plus £3 19s. fitting.

Prices shown are for a limited number of units suitable for trucks with engines of 30 h.p. R.A.C. rating. Most of the firms also manufacture units suitable for tractors and cars, but the prices for these variations would have to be determined by enquiry to the firms concerned.

Of the above firms, Messrs. Powell, Messrs. Wishart, and Messrs. Fleet Forge have Queensland agents—Olympian Auto Services, Adelaide street, Brisbane; Buzacotts Ltd., Petrie Bight, Brisbane; Eagers Pty. Ltd., Adelaide street, Brisbane, respectively.

Other Queensland manufacturers whose units are now available include:—

(1) W. Telford, care of Toowoomba Electric Light and Power Co. Ltd., King street, Warwick (Telford Producer).
(2) Campbell Bros., Bowen Hills (Gohin-Poulenc Producer).
(3) S. F. Manfred, 732 Ann street, Brisbane (Sheldon-Reddie Producer).
(4) Pollards Ltd., corner Margaret and Albert streets, Brisbane (National Emergency Producer).

Neither the Commonwealth nor any of the State Departments has prepared plans and specifications for an approved type of producer. There are available to the public plans and specifications of several types of producers, but these have not been examined closely by any Government Departments. The public are warned that they should exercise caution before proceeding to manufacture and instal such units.

With any of the approved units it will be found that the charcoal consumption will be such that 13 to 16 lb. of charcoal will be approximately equivalent to 1 gallon of petrol.

CHARCOAL.

(a) Market.

The present market is not extensive. Apart from blacksmiths, foundries, and poultry farmers, the only regular demand comes from small power houses, or from firms requiring power to drive machinery —butter factories, joinery works, &c. On account of its relatively large bulk, it is not profitable to transport charcoal any distance (e.g., 50 miles), so that, in any area, the charcoal demand would be governed largely by local conditions.

There is a great deal of interest at the moment in charcoal as a possible substitute for petrol in trucks, cars, and tractors. In Western Australia there are over 700 units in operation, but in Queensland there would be probably not more than 100.

(b) Timbers Suitable for Charcoal.

We have manufactured charcoal from twenty-six different species, and have found that most species produce satisfactory charcoals, but that there is a considerable variation in density, heavy woods producing denser charcoals, which are generally more acceptable because more fuel is available for the volume occupied. There are a few species which have not given satisfactory results in portable producers, however, and it is recommended that those intending to burn charcoal advise us of the species proposed, so that we may advise as to the most satisfactory types. Unless the burning operation is properly carried out the product from even the best timber may be unsatisfactory.

(c) Manufacture of Charcoal.

(i.) Perhaps the simplest method is to use a pit. Several pit methods are used, and a simple scheme which will give satisfactory charcoal is outlined here.

A pit, roughly 3 ft. deep by 3 ft. wide by 15 ft. long, is dug in suitable soil, allowing a little batter on the walls if desired. In the bottom are laid twigs and branches to a depth of 12 in. This is thoroughly ignited and then the main billets, up to 8 and 10 in. in diameter, are thrown in carefully lengthwise until the pit is filled to a height of 2 ft. to 3 ft. above ground level. After several hours the pit should have burnt down level with the ground line. At this stage, billets should again be piled on, again to a height of 2 ft. to 3 ft. above the ground line. As this pile burns, holes which burn out are filled with small timber until the pile again burns to the ground line, then the pit is completely sealed with sheet iron and earth, and every effort made to prevent air from getting into the pit. Wherever smoke is seen coming through the seal, further earth should be shovelled on. In operating these pits, dry timber burns more quickly, and is easier to handle than wet.

After about forty-eight to seventy-two hours, the pit may be opened and the charcoal bagged, but careful watch must be kept to detect any hot spots from which a fire might ultimately generate. If a hot spot is detected, the charcoal should be moved carefully with a shovel and quenched. If the charcoal is still too hot and tends to fire in several places, then the pit must be sealed again to allow further cooling.

From such a pit about twenty to thirty bags of charcoal—i.e., about 10 to 15 cwt.—are obtained. The chief disadvantage of the pit method is that portion of the charcoal so produced is likely to be contaminated with earthy matter.

Many burners line the pits with iron to prevent this contamination, but where suitable lining material is not available, then the "floating" method should be quite satisfactory to remove dirt from all doubtful bags. It has been found that "floating" *cold* charcoal on water separates all the earthy matter, and adhering moisture can be dried from the charcoal by spreading out and exposing to the air for a few hours.

(ii.) Charcoal may also be made in portable retorts. Such retorts cost between £30 and £100, depending on the design and size. Such retorts produce charcoal free from dirt and are much favoured where a clean charcoal is desired. However, unless a number of retorts are operated simultaneously the cost of operation is unprofitable.

(d) Price.

Price paid by consumer varies considerably. In country districts relatively good quality lump charcoal can be bought for about 1s. 6d. per bag (of about 55 lb. each), i.e., 60s. per ton.

If the charcoal is screened and graded the price may be twice as much.

City prices would show an increase of 20 per cent. or more; at the moment, charcoal of fairly good quality is being retailed at 1s. 6d. per bag.

(e) General.

Charcoal for portable generators should be entirely free from any earth and sand contamination, should be well burnt, i.e., completely carbonised so that tarry substances will not tend to reach the engine, and free of dust.

It is also important that the wood used has comparatively low ash content—a timber with a silicon ash is unsatisfactory.

The size of charcoal used is largely dependent upon the type of producer used, and various makers have different recommendations. In general, small charcoal gives greater flexibility.

CONSUMPTION OF CHARCOAL, OIL, AND KEROSENE IN TRACTORS.

The most authentic record of fuel consumption on farm tractors is that of Mr. E. C. Powell, Agricultural Instructor of the New South Wales Department of Agriculture, reported in the September, 1939, issue of New South Wales Agricultural Gazette.

The records of fifteen owners of producer gas plants are given. A summary of these records is given below:—

Conditions of Working.	Average Fuel and Oil Consumption per Ten-hour Day.			
	Producer Gas.		Kerosene.	
	Charcoal.	Lubricating Oil.	Kerosene.	Lubricating Oil.
	Bags.	s. d.	Gallons.	s. d.
Full load	5	1 7	20	4 0
Light load	4	1 7	18	4 0

The range of oil hours with producer gas varied from 60 to 200 hours, while with kerosene the oil life was from thirty to sixty hours, but the figures of 100 and 40 have been taken as the average oil life for producer gas and kerosene respectively.

A table showing the estimated schedule of cost of operating tractors has been compiled by this Department. From this table, costs for any individual case can be readily interpolated.

SCHEDULE OF COSTS OF GAS PRODUCER OPERATION ON TRACTORS.

Item.	Cost per Week, According to Number of Days Worked per Week Each of Ten Hours.			
	1	2	3	4
	s. d.	*s. d.*	*s. d.*	*s. d.*
With Charcoal—				
Fixed cost, interest, and redemption on plant, and fixing for life of five years on capital cost of £125	9 10	9 10	9 10	9 10
Maintenance of generator scrubbers, &c., ½ hour per day	1 0	2 0	3 0	4 0
Charcoal fuel, 4 bags per day (light load)—				
At 1s. 3d.	5 0	10 0	15 0	20 0
At 2s.	8 0	16 0	24 0	32 0
Lubricating oil cost 1s. 7d. per day (life 100 hours), 3 gallons per fill	1 7	3 2	4 9	6 4
Petrol (½ gallon per day)	1 0	2 0	3 0	4 0
Total cost per week	18 5 21 5	27 0 33 0	35 7 44 7	44 2 56 2
With Kerosene—				
Kerosene, 18 gallons per hour, at 1s. 3d.	22 6	45 0	67 6	90 0
Lubricating oil, 4s. 4d. per day (40 hour life—3 gallons per fill)	4 4	8 8	13 0	17 4
Total	26 10	53 8	80 6	117 4
Savings per week using charcoal	8 5 5 5	26 8 20 8	44 11 35 11	73 2 61 2

Similar analysis with regard to road vehicles is a little more difficult, inasmuch as pay load is reduced and operating conditions vary vastly. As a rough guide, however, it may be taken that a 30-cwt. truck operating on reasonably long hauls—not less than 20 miles—would have to cover a minimum of 200 miles per week before real savings were effected.

The above analyses are based solely on economic factors. In the event of liquid fuel rationing or shortage, the advantages of charcoal as a fuel would be increased—in fact, the use of producer gas would probably become essential for national welfare.

Termites or "White Ants."

BY J. H. BUZACOTT.*

THE small insects commonly known to farmers as "white ants" prove destructive at times both to sugar cane and to farm buildings. The term "white ant," however, is a distinct misnomer, for although these insects, or *termites* to give them their correct name, are social in habit, they are not ants and are entirely different from true ants, both in their behaviour and their biology.

Termites may be classified in two main groups—viz., wood-dwelling species and earth-dwelling species. The first group may be further divided into drywood forms and dampwood forms, whereas the main bulk of the second group is made up of subterranean termites. It is this last group which contains the various species of chief interest to the farmer.

Subterranean termites have their nests in the ground and may or may not build a surface mound. Some of the species which attack cane have mounds of a distinctive type which may be readily recognised, whereas others, notably the *Giant termite* (*Mastotermes Darwiniensis*), build no mound and their nests are correspondingly difficult to locate.

The principal food of termites is cellulose in some form or other, and this is obtained by the insects from timber, trees, sugar cane, and other substances of which the chief constituent is cellulose. In search of food materials the termites will travel a considerable distance from their nests through specially constructed tunnels, for, with the exception of winged individuals during the swarming period, the other castes are light-shunning. It has been recorded that some species will travel several hundred yards from the nest and still maintain communication with it.

Most species of termites require to live in an atmosphere practically saturated with water vapour. In the coastal areas of tropical and sub-tropical Queensland this condition is easily realisable in the soil and, generally speaking, moisture could not be regarded as a limiting factor in the distribution of species which affect cane. The most destructive species to sugar cane, however, the giant termite, is exceedingly restricted in range through the sugar belt as it only attacks cane in a comparatively small area in the Burdekin district. The particular coastal area frequented by Mastotermes occurs in the driest portion of the tropical coast and it is probable that this pest requires either specific conditions of rainfall or soil temperature for its survival.

The giant termite not only destroys the older mature sticks standing in the field, but it also eats into the newly planted sett underground and destroys the young shoots before they have time to become established. One feature of its attack on standing cane is the fact that the presence of the insect is not apparent until the cane is destroyed as Mastotermes eats the cane from the ground upward leaving a complete shell and it is not until the termites reach and destroy the growing point that the cane shows distress. The presence of this termite in standing cane is manifest by the appearance of "dead hearts" similar to those caused by the moth borer.

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* In *The Cane Growers' Quarterly Bulletin* for April, 1940.

Generally speaking, Mastotermes causes its most severe damage during dry seasons, for the insect probably visits cane more freely under these conditions in order to use it as an easy source of maintaining the necessary moisture content in the nests. It has been found by some farmers that frequent watering of affected patches will result in a cessation of damage.

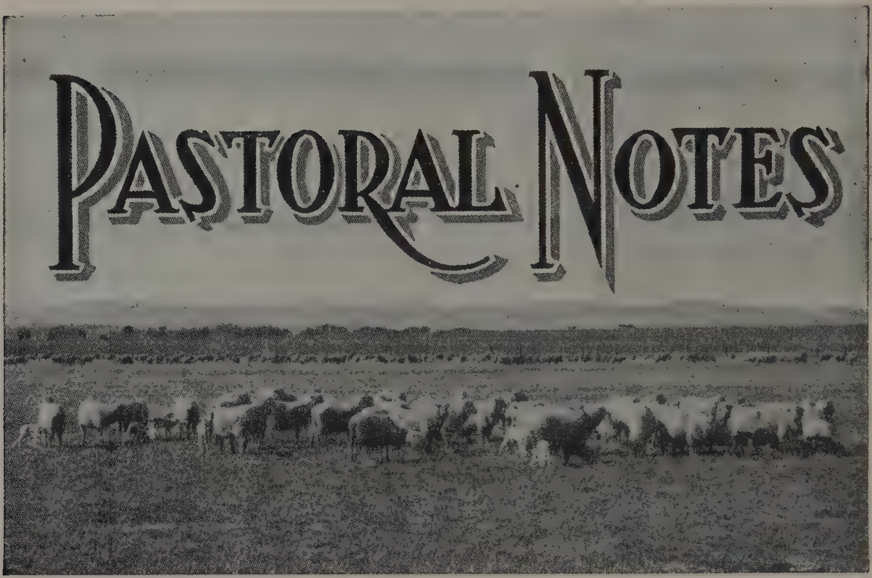
A general method of control is to clean up, as far as possible, all fallen and useless timber in the neighbourhood of the farm and to pay particular attention to the poisoning of fence posts. When infested timber or fence posts are reasonably dry, by far the best way to destroy the termites is to blow Paris green powder with a dust blower through a small hole made into the tunnels in which the insects are operating, and sealing the hole with mud after the operation. The value of this poison lies in the fact that the insects traverse treated tunnels and become covered with the Paris green dust. By the process of grooming one another, granules of the poison are distributed among others of the colony and widespread death results. Thus the treatment of a fence post may result in the destructon not only of the termites within the post, but also of numbers in the main nest which may be situated a considerable distance away. If the hole be not sealed after treatment the termites will cease to use the treated tunnel, thus rendering useless the effort made to destroy the pest.

Paris green used as above is also particularly suitable for the destruction of termites in farm buildings. Naturally in new buildings it is better to use concrete foundations or posts and timber impregnated with a repellent such as creosote in order to prevent the entry of the pests in the first place.

Several other species of termites besides *Mastotermes Darwiniensis* attack sugar cane but it is only on rare occasions that they destroy standing cane. More frequently they confine their attentions to stools or setts, and in the latter case, are the cause of poor strikes. Usually infestation from these species results from wood debris in the canefield, or from infested fence posts and timber near by. Frequently in the region of a damaged sett the remains of an old stump may be located under the ground. Such debris should be removed and destroyed, likewise any extraneous timber adjoining canefields. Fence posts should be examined carefully and where evidence of the attack is noticed they should be treated with Paris green as indicated above for Mastotermes.

In regions where termite damage is prevalent, steel or concrete fence posts are worthy of consideration by the farmer. Paris green is also the most efficient poison for the treatment of small species of termites in farm buildings. This should be used in a manner similar to that described previously, care always being taken to see that the tunnels are adequately sealed after the treatment with the poison.

Care should be taken in the use of Paris green as it is a deadly poison and should be kept out of reach of children and animals.



The Fat Lamb Scheme.

JAS. CAREW, Senior Instructor in Sheep and Wool.

Following is a summary of lamb sales during the season 1939-40:—

IN all, 5,934 lambs came under review in making out the respective averages. Dorset Horn and Border Leicester crosses were among the greatest number of sales. The rise and fall of values at the respective sales has a big influence over the average for the respective breed, as, for instance, the Romney Marsh cross which was only included in one sale which happened to be on a good market.

DETAILS.

	£	s.	d.
Lambs from Border Leicester rams included in sixteen sales—			
From merino ewes—1,057 lambs averaged	0	16	9
From Corriedale ewes—77 lambs averaged	1	0	0
From Romney March cross—66 lambs averaged ..	0	18	3
From Border Leicester cross—175 lambs averaged ..	0	18	6
From crossbred cross—54 lambs averaged	0	19	0
From comeback cross—417 lambs averaged	0	17	0
From all ewes cross—1,846 lambs averaged	0	17	5
Lambs from Southdown rams included in ten sales—			
From merino ewes—206 lambs averaged	0	16	8
From Border Leicester cross ewes—126 lambs averaged	0	18	11
From Romney Marsh cross ewes—66 lambs averaged ..	0	18	3
From crossbred ewes—71 lambs averaged	0	18	11
From comeback ewes—55 lambs averaged	0	17	3
From all ewes—524 lambs averaged	0	17	10

Lambs from Dorset Horn rams included in twenty-nine sales—			
From merino ewes—1,548 lambs averaged	0	17	2
From Border Leicester cross ewes—514 lambs averaged	0	18	4
From crossbred ewes—318 lambs averaged	0	17	6
From English Leicester cross ewes—622 lambs averaged	0	16	6
From comeback ewes—73 lambs averaged	1	0	4
From all ewes—3,075 lambs averaged	0	17	4
Lambs from Corriedale rams included in four sales—			
From merino ewes—70 lambs averaged	0	13	10
From crossbred ewes—82 lambs averaged	0	17	6
From all ewes—152 lambs averaged	0	16	0
Lambs from Romney Marsh rams in one sale—			
From merino ewes—258 lambs averaged	0	18	3
From comeback ewes—79 lambs averaged	1	1	3
From all ewes—337 lambs averaged	0	19	0

All lambs over the season averaged 17s. 5d.

The outstanding feature of the season's sales was the advantage and importance of the crossbred ewe, no matter what breed or ram was in use.

CLASSING THE EWE FLOCK.

Many grazing properties in Queensland are now stocked well up to their carrying capacity, and, with the coming crop of lambs to be provided for, some reduction in numbers may be necessary. It is better to own a flock of good ewes than a flock containing a mixture of good and bad stock. Besides being more profitable, it should give the owner far more satisfaction to have a flock as near as possible to uniformity in type and which will cut a heavy fleece of good quality wool.

On most large holdings, classing the ewe flock forms part of the station routine, and there is no reason why smaller flocks should not be classed in the same way.

Just before shearing is the most suitable time to do the classing and, usually, the flock can be classed in three groups to advantage. The tops should consist of all the large-framed deep-bodied ewes carrying a covering of even type, well grown, and showing the character and colour typical of the breed. Ewes selected for the main flock should be as free from fault as possible, but need not be so even or up to the standard of the tops. The third class will be the culls, including light cutters, ewes producing inferior wools in quality or colour, and ewes rejected for defective frames, weak constitution, or objectionable folds or wrinkles. The rams to be mated with them should be classed in the same way, the best being selected for the top line. All culled ewes should be fattened, and sold as soon as possible; likewise those cast for age.

PREPARATION FOR SHEARING.

Before the shearing season starts, graziers would be well advised to give that necessary attention to the shed, plant, and yards.

Starting is often delayed, because everything has been left to the last minute. The shed itself should be clean, and all pen gates and hinges seen to to ensure convenient working. Grating floors, also, should be attended to where necessary.

The down shoots should be carefully repaired, if necessary, thus ensuring that shorn sheep are not ripped by outjutting nails, splinters, or other projections. Counting-out pens nearly always need repairing. The branding race and the gates at both ends should be in good working order.

Inside the shed, all machinery should be overhauled, belts examined, handpieces attended to, and oil cans ready.

The wool bins may need a nail or two, new rungs may be required in the wool-rolling, piece-picking, and classing tables.

The wool press should be overhauled thoroughly and the ropes examined, for if new ropes are necessary, rigging them is a long job.

Have wool packs placed conveniently near the press, and all tools used in pressing in their places. Scales should be tested and every other detail attended to. If this work is neglected until the commencement of shearing, delays and frayed tempers are inevitable.

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A MAINTENANCE RATION.

All livestock rations are divisible into two parts—the part used for maintaining the body in a healthy condition and the part used for production, whether it be for hair, wool, fat, meat, milk, or progeny. Under severe winter or drought conditions the livestock owner is more concerned with a maintenance standard of feeding, and it becomes important to know where economies may most effectively be introduced.

A short consideration of an animal's reactions to starvation will supply the answer. Take the dairy cow in full lactation: the first defence which nature attempts is a conservation of material and the milk yield falls rapidly. Supplies to the body covering are restricted, and a dull, shaggy, lustreless coat develops. The body reserves of fat are called on and the animal becomes thinner. Horns and hooves become brittle. As starvation advances, some encroachment is made on the last defences—the muscles and vital organs. At this stage, the animal weakens rapidly and collapse followed by death results. It is, therefore, clear that the last defences of the body—i.e., the muscles and vital organs—must be protected. For this purpose, the animal must be supplied with protein. In other words, drought feeding should centre round protein-rich foods. Where the stock are close to the source of such foods, the relative merits of each should determine which is to be fed, but on distant properties where freight charges are high it becomes important to buy the most concentrated and most digestible preparations.

Producers often remark that nature gave the sheep a commodious intestinal tract which must be filled, and they usually buy roughage of only moderate protein content. The argument is fallacious when the question is one of maintenance for limited periods only. It is surprising how well sheep can keep their condition on as little as 2 oz. of cotton seed meal and 4 oz. of maize daily.

The mineral requirements of stock should be provided for, but the excessive quantity of salt in many licks is unnecessary. Animals are capable of retaining enough salt for normal body functions from a very restricted intake, but lime and phosphate are continuously excreted and must be supplied in greater quantities. More than 30 per cent. of salt in a lick is rarely necessary, and in most cases it could well be less. Lime and phosphate are supplied in a number of forms, but on current prices well-prepared sterilized bone meal containing about 20 per cent. protein is, apparently, the best.

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WATER ON THE GRAZING FARM.

It is not every grazing farmer who is fortunate enough to have surface water on his property. Consequently, provision has to be made for water supply by bore, drain delving, well-sinking, or tank-making.

Much money may be wasted in attempted provision of surface water. It is a common experience to see as many as three or four tanks, ranging in capacity from 1,000 up to 1,500 cubic yards on a single property. These earth tanks provide water in good seasons, but may be quite empty when water is most wanted in a dry time. If the whole of the money invested in ''pot holes'' had been expended on one large tank, the supply would probably be adequate and permanent, more or less.

A mistake is often made by fencing a paddock and then trying to water it adequately. If first a large tank is excavated at a central site, and country then subdivided for convenient watering, money would be saved, security obtained, and value added to the property.

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CONCENTRATES AND LICKS FOR DAIRY CATTLE IN WINTER.

Stock licks are necessary in many districts throughout the year. However, licks plus dry grazing will not be sufficient to maintain stock in reasonable condition, because the protein present in such a combination is not sufficient.

The provision of a protein concentrate is essential if condition and production are to be maintained. The actual form in which the concentrate is to be fed will be largely a matter of convenience and cost.

Most farmers are acquainted with the commercial protein concentrates, e.g., linseed meal, cotton seed meal, coconut oil cake, blood meal, and the various nut cakes commonly used for drought feeding of sheep. Advice on the use of these may be obtained from the Department of Agriculture and Stock, Brisbane.

FLOCK MANAGEMENT.

A tendency at times to leave sheep too long in the one paddock has been observed. It is no rare thing, for example, to see sheep shorn, driven to a particular paddock, and left there until the next shearing.

Sheep respond quickly to change of pasture, and the change is noticeable both in the health and condition.

Sheep will often benefit, even if placed in a comparatively worse paddock than that on which they have been running for a brief period. On a breeding property, provision should be made for the ewes and lambs by spelling a paddock well before lambing time. Should rain fall while the paddock intended for the ewes and lambs is spelling, it is all to the good, for the succulent new growth so much to be desired for ewes and lambs will be available. At weaning time there is again a necessity for fresh feed, for it should be fully realised that as a weaner a sheep is going through its most tender period. Grass seed country should not be considered where weaners are concerned.

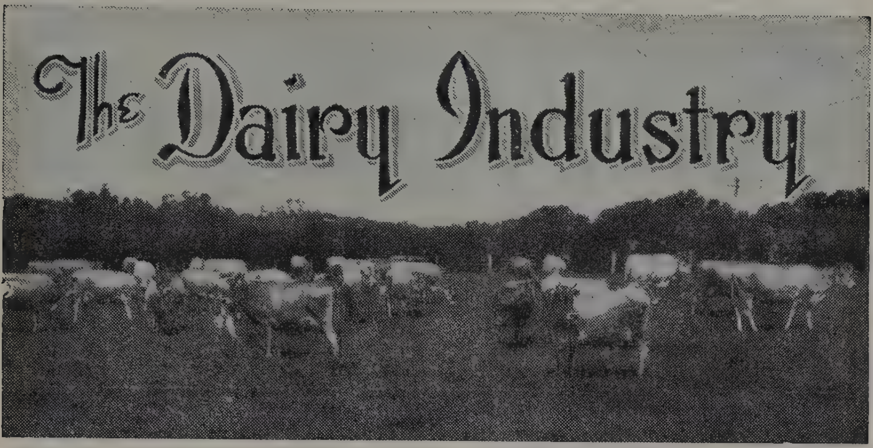
CATTLE LICE.

A heavy lice infestation of all classes of cattle, particularly dairy cows, has become a serious matter to stockowners in parts of Central Queensland. The lice—the long-nosed sucking louse and the short-nosed sucking louse—usually make their appearance on cattle in the winter months, becoming most active in the spring when the warm weather sets in.

The presence of lice on cattle is indicated by ceaseless skin irritation. In their efforts to ease this irritation, the cattle rub themselves against fences, stumps, and trees, and soon become almost denuded of hair on the neck, dewlap, and rump. Whole patches of skin become raw from rubbing; other parts of the animal also become affected.

The ordinary arsenic and soda dip is ineffective against the lice, but if three-quarters of a gallon of crude cresylic acid is added to every 400 gallons of dipping fluid, good results will be obtained. For the treatment of dairy cattle and stud bulls by spraying a solution of one ounce—two tablespoonsful—of nicotine sulphate solution (40 per cent. or thereabouts) in six gallons of water has proved effective. In either case, the treatment must be repeated in fourteen days in order to destroy the pest. The reason for this is that the first treatment only kills the lice actually alive on the cattle at the time, and will not destroy the small eggs which are attached to the hair of the animals. Within fourteen days all these eggs will have hatched, and the young lice will soon be capable of laying eggs, and so continuing the cycle. For treatment to be effective it is, therefore, most important that a second dipping or spraying should be done not later than fourteen days after the first treatment.

Cattlemen who are at present troubled with lice in their cattle will be well repaid if treatment on these lines is carried out as soon as practicable.



Variations in Milk Tests.

VARIATIONS in the fat test of milk which occur from time to time often cause misunderstanding among dairy farmers, particularly cheese factory suppliers. Actually, such variations are bound to happen and are conditioned by a number of factors, which may be conveniently divided into:—

(*a*) Natural or inherent causes.
(*b*) Other causes.

There are two main factors which cause natural variations in fat tests—breed and individuality. Breed is the more important factor influencing the percentage of fat in milk, as it is well known that cows of certain breeds are noted for high fat contents. For instance, Jersey and Guernsey milks are usually richer than Australian Illawarra Shorthorn and Ayrshire milks, which, in turn, are richer than Friesian milk. Within any breed, however, certain families give milk above average quality for the breed, while others give below the average, because of fat content being an hereditary characteristic. An increase in the butter fat percentage in the milk of a herd can be brought about by introducing a bull from a high-production and high fat-testing family.

Apart from the inherent or natural causes of differences in fat tests, the chief factors are:—

1. Stage of lactation.
2. Season of year, temperature and weather conditions.
3. Interval between milkings.
4. Health.
5. Efficiency of milking.
6. Excitement and oestrum, or "heat."
7. Age.
8. Exercise.
9. Feeding and condition of animal.

The stage of lactation exerts a marked effect on fat tests in this State, because most cows calve in the one season of the year—spring. It is generally found that soon after calving the tests are slightly above normal, followed by a gradual reduction until the lowest level is reached about the time of maximum milk yield—that is, three to four months after calving. Tests then remain fairly stationary for some time, but a higher figure will be again recorded when the end of the lactation period is approaching and the milk yield is declining to its minimum.

As to the influence of season of year and temperature, fat tests are lower in summer and higher in winter. In Queensland, the period of minimum fat content in the lactation cycle coincides with the hottest months and as high temperatures also depress the fat content, it should be easily understood why tests are lowest at that time of the year. Butterfat test records at many cheese factories have revealed the difference between January and June tests to be about 0·3 per cent. It is difficult to estimate the effect of sudden changes in weather, as other accompanying factors—food supply, water, &c.—often disturb the fat content and especially the total yield of milk. For instance, it is usual to change cows from green, succulent feed to dry paddocks during rainy weather and it has been observed that there is often a diminution in milk yield and a sudden appreciable rise in fat content. At one factory visited 6,272 gallons of milk of an average test of 3·6 per cent. were received in a week before rain, while in the week in which rain fell the milk supply dropped to 5,762 gallons and the mean test rose to 4·1. Drought also tends to slightly reduce the fat content and to greatly decrease yields.

The interval between milkings constitutes the most important factor causing differences to occur in the fat content of the milk of an individual cow. It is usual for the morning's milk, produced after the long night interval, to be of greater quantity and lower fat tests than the evening's milk, and the magnitude of this divergence may be as great as 1 to 2 per cent. if the periods between milkings are very irregular. It should thus be obvious to anyone sending samples to a laboratory, or any other place, for check testing, that care should be taken not to select just morning or night milk as a check against the factory test. At factories, a representative sample of the mixed night and morning milk is taken and it also is essential for the farmer to obtain a true sample of the mixed milk, if he is to avoid dissatisfaction because the results obtained on a sample taken by him are at variance with the factory tests. Likewise, some farmers in order to obtain butter for household use habitually skim some cream from the evening's milk before sending it to the factory next morning. The effect of this practice in decreasing tests also should be borne in mind if a sample of unskimmed milk is forwarded for check purposes.

The fat content is subject to alterations if an animal is indisposed, if recently calved, if the udder receives a chill, or if any other abnormal condition arises. Some samples of mastitis milk recently analysed contained as low as 1·5 per cent. of butterfat.

Incomplete stripping of a herd may result in a diminished fat content and a decreased yield and, if continued, causes cows to dry off more rapidly than if thoroughly stripped at each milking.

Excitement, oestrum or "heat," age, and exercise, although responsible for disturbances in the fat content of the milk of a single cow, are unlikely to exert any bearing on the fat content of the bulked milk of a herd.

Contrary to the opinion of many farmers, the conclusions reached from numerous investigations in various countries are that in herds of cows receiving an adequate and balanced ration, changes in feeding can, at most, cause only a slight and temporary change in fat content and a permanent alteration cannot be induced by this means. It is usually conceded that a cow, if well nourished and fit at calving time, will give a better yield in the ensuing lactation period than if she calves in poor condition, and overseas investigations also have shown that a slightly higher fat test will be maintained.

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COWS CALVING AT SHOW TIME.

Competitors in dairy classes arrange usually for the calving of individual cows about show time, so that they may be brought before the judge with all their characteristics of production strongly in evidence.

Should calving be delayed until the show is in full progress, the noise and consequent excitement may cause the continuance of labour pains, although weakly, for many hours, thus exhausting the cow and, perhaps, endangering the life of a valuable calf. In these cases, it is advisable to seclude the cow in a quiet part of the building, where there is no traffic, where curious visitors may be excluded, and where any attention required may be given only by her regular attendant. In these surroundings the cow soons settles down, the pains become strong and effective, and the calf is born without any trouble.

Immediately the calf is dropped, it is advisable to tie the navel string, close to the belly, with strong thread or silk, which has previously been soaked in a suitable disinfectant, and to paint the part with strong tincture of iodine. Neglect of this precaution may allow the entrance of infection leading to fatal disease.

The calf should receive for the first few days all it will drink of its mother's milk, as the colostrum it contains acts as a laxative, removing offensive material from the bowels, and is essential to the future well-being of the calf.

If the cow has been subjected to great excitement through travel and strange surroundings, the first milk she yields should be discarded, for such milk may cause digestive disorder leading on to fatal diarrhœa. It is safe to feed the second and subsequent milkings to the calf.

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SCUMMY CREAM.

It often happens that when cream is being put through the strainer into the vat at a factory, a quantity of thick greasy substance is retained by the strainer. In most cases, this is due to the inclusion of the thick scum from the interior of the separator bowl with the cream. This is a practice which cannot be condemned too severely and results frequently in the cream being graded down.

REJECTION OF THE FIRST-DRAWN MILK.

The first thing to do to ensure clean and, therefore, profitable milking is the washing of the cow's udder and teats to remove dust and dung particles and loose hairs, which, if they fall into the milk, carry with them enormous numbers of bacteria. The second is the removal of the first-drawn or ''foremilk,'' which is a less commonly recognised source of troublesome organisms. The small quantity of milk left after milking within the narrow canal leading from the udder to the outlet of each teat forms a good breeding ground, where nourishment, moisture, and a suitable temperature are available for growth.

Because of their minute size, bacteria can penetrate past the ''sphincter'' muscle, which closes the teat when milk is not being drawn, and, especially in the case of older cows, where this muscle has become slack, large numbers may enter and become established in the teat canal between milkings. Thus it is advisable, before milking is begun, to remove into a separate vessel—a small pail or billycan is suitable, but *not* a milking bucket—the first two or three streams from each teat. This will wash the teat canal free or almost free from contaminating organisms.

Experiments have shown that the foremilk, compared with the middle milk and strippings from the same cow, contains by far the largest proportion of the total bacteria, and, when it is considered that most of these may be from pasture, dung, soil, or contaminated stagnant water, which contain particularly obnoxious types, the value of rejecting the first-drawn milk can be better realised. It has been found to be an important contributory factor in lengthening the life of milk, whether it is intended for human consumption, cheese-making, or separation of cream for butter-making, and in avoiding bacterial taints and troubles, such as ropiness and sweet curdling.

A far more important reason, however, why every farmer should make a practice of removing the foremilk regularly at each milking is that it enables him to notice anything abnormal in the appearance of the milk. Early indications of mastitis usually show up in the form of tiny clots or strings in the first drawn milk, which if observed may mean the detection of animals having one or more affected quarters, before the disease becomes serious. Special care may then be taken to milk the infected cows last; their milk is then isolated from the rest, and the spread of the disease to other cows in the herd prevented.

In no circumstances should the foremilk be withdrawn on to the floor of the milking bail, for this is one of the surest ways of spreading any infection that may be present. Apart from this, decomposition will occur with accompanying bad smells and attraction of flies.

It is well known that the highest percentage of butterfat in milk is contained in the strippings and that the first-drawn milk is the poorest portion, so that discarding it will involve only a small loss in quantity, which is more than offset by the improvement in keeping quality.

In large herds, where the quantity of foremilk is considerable, it can be pasteurised or boiled and used for calf, pig, or poultry feeding, unless definitely known to be infected. If it contains milk from diseased quarters, it should be disposed of by adding some disinfectant and emptying well away from cowbails and water supply.

Registered Hatcheries

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven	White Leghorns
A. F. Buchler, Milman	Pincrow	White Leghorns
J. Cameron, Oxley Central	Cameron's	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled	Rhode Island Reds
B. Cross, Apple Tree Creek, Childers	Spring Hill	White Leghorns, Australorps, and Langshans
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield	Woodville	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
W. Easson, Formosa road, Tingalpa	Grassdale	White Leghorns and Anconas
E. O. F. Eckert, Laidley	Laidley	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner	Australorps
Elks and Sudlow, Beerwah	Woodlands	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Grice, Loch Lomond, via Warwick	Kiama ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
S. W. Kay, Cemetery road, Mackay	Kay's	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird ..	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara ..	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	Australorps and White Leghorns
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels ..	Australorps
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, White Leghorns, and Brown Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
S. V. Norup, Beaudesert rd., Cooper's Plains	Norups ..	White Leghorns and Australorps
H. W. and C. E. E. Olsen, Marmor	Squaredeal ..	White Leghorns, Black Leghorns, Australorps, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central ..	Pennefathers ..	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View ..	White Leghorns and Australorps
H. K. Roach, Wyandra ..	Lum Burra ..	Australorps and White Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa ..	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
J. Steckelbruck, The Gap, Ashgrove	Cosy Nook ..	White Leghorns and Australorps
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps
P. and K. Walsh, Cleveland ..	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Atherton ..	Weaver's ..	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby ..	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps
R. H. Young, Box 18, Babinda	Reg. Young's ..	White Leghorns, Australorps, and Brown Leghorns

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EGG PRODUCTION.

In breeding poultry, the farmer should exercise the utmost care in order to establish and maintain a high quality flock. Considerable progress has already been made in the improvement of breeding practice. Egg production has been increased from about 60 eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with the egg production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote twelve dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than thirteen dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. In these experiments, 116 pullets were used, and the average of the two years was over fifteen dozen eggs, and even these birds in their second year laid over thirteen dozen. The birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding, in conjunction with good management and feeding.

The chief considerations in establishing standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics.

Having selected birds reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid. As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs, respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly, it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and, consequently, would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny and should be discarded, irrespective of other characteristics.

Plate 5.
IN THE WHEAT LANDS OF THE DARLING DOWNS.

"Oh, I am the grass that has conquered man
I am the King that is Bread:
Your Armies and Fleets are but fragile things
That await a nod of my head."

Agricultural Notes

Winter Preparation of Land for Maize.

TO get the best results, maize requires a good soil in which a plentiful supply of plant food is available—a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during winter and allowed to lie in the rough until early spring. The action of frost and rain will improve the texture of the soil and will leave it in a mellow condition. In early spring, the land should receive a second ploughing which, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be followed immediately by a harrowing and cross harrowing to work the surface soil into a fine tilth.

If a crop of weeds is turned under during the second ploughing, planting should not be carried out for at least a few weeks to allow the weeds to rot. On land which is not too heavy and moist, rolling is desirable as it consolidates the soil and helps to make a good firm seedbed. Rolling should always be followed by a light harrowing.

Preparation of Seedbeds.—The preparation of the seedbed is one of the most important points in the production of maize. No amount of after cultivation will undo the damage caused by planting in a badly prepared piece of land One has only to see the difference, not only in the growth, but also in the colour of the foliage between a crop grown on thoroughly prepared and another on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a well prepared seedbed—in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to plant.—The best time to plant will naturally vary in different districts. In districts which have a long growing season and a comparatively regular rainfall, planting can be done whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district; and, secondly, to plan to have the crops tasselling, if possible, during periods in which rain can usually be expected. Maize must have moist conditions when tasselling, and if hot, dry winds occur during this period, the pollen is shed too early and fertilization cannot take place.

Seed should be sown in drills spaced 3 feet 6 inches to 4 feet apart. The wider spacing is essential for the tall-growing, late-maturing varieties. As a general rule, single spacing in the rows gives the best results, the grains being dropped singly, with a distance of approximately 12 inches between the grains for the quick maturing varieties, and from 15 to 18 inches for the late maturing varieties.

From 9 lb. to 12 lb. of seed is sufficient to plant an acre, when sown in this way.

The seed drill is the best implement for sowing maize, as it ensures a good even spacing and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

WINTER-GROWING RHODES GRASS RISKS.

Although warnings that the so-called winter-growing or frost-resistant Rhodes grass is a potential source of danger to grazing stock have previously been issued, some farmers may not yet be aware that this grass should be grazed with caution. Winter-growing Rhodes grass should not be confused with the more common Rhodes grass which makes a very valuable pasture.

The prussic acid content of winter-growing Rhodes grass has been determined in samples collected both in Queensland and in New South Wales, and the quantity found was sufficient to indicate that the grass may sometimes be toxic to animals. Little is known about the conditions under which stock losses due to ingestion of the grass may occur, and stockowners are advised to be very careful when paddocks of the grass are being grazed.

In districts where high-yielding winter-growing grasses and clovers can be grown the use of the winter-growing Rhodes grass for grazing purposes is not recommended.

DO NOT WASTE FODDER.

Having experienced very favourable conditions during the last few months, most farmers are in the position of having a plentiful supply of grass for stock both for present needs and for winter.

In the circumstances, there is a tendency to underrate the importance of standing crops of summer fodder, and there is apt to be considerable waste. This is accentuated by the fact that crops such as Sudan grass, which have grown luxuriantly, and appear very difficult to handle, have been badly discoloured by rust and stain resulting from the humid conditions. The unattractive appearance of these crops should not be considered a good reason for waste or just turning the cows in to pick up what they can. Stained Sudan is not palatable, and stock are just as likely to graze the grass on the headlands as eat the crop.

Silage or hay is the only method of turning this excess mature fodder into good account, and if the crop is stained it should be made into silage rather than hay. Sink a pit or build a silo stack immediately before the fodder becomes too dry. Later on when the next dry spell comes stock will turn to good and profitable account every scrap of surplus fodder whether it be grass or crop, rusted or clean, on every property in the Maranoa. But it should be made into hay or silage.

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SWAMP LANDS.

Throughout a considerable stretch of the northern coastal country are many swampy areas of lesser or greater extent, particularly in the wetter regions where dairying is now being developed. These lands, to a large extent lying idle, could, at no great cost, be brought into production by planting them with para grass. This grass is easy to establish, because of its habit of rooting freely at the nodes. It is a rather coarse, vigorous grower, but has succulent stems and leaves and gives a large quantity of green material per acre. Under favourable conditions, yields of over 30 tons per acre have been obtained in one year. It is easily cut back by frost, and is, therefore, most suitable for the warmer localities.

This grass grows well in swampy localities, the runners going out even into deep water. Once established, it holds its own with any other grass. It has a further advantage in that it is credited with completely drying out marsh lands.

Para grass is usually propagated by runners, which root readily. These runners can be easily planted in furrows about 3 feet apart and about the same distance between the rows.

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NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Horticultural
Notes

Planting the Queensland Nut.

WHERE it is proposed to plant an area of the Queensland Nut on open or forest ground, the land should now be got ready for planting time in August. Thorough deep ploughing of the area will be necessary to give the young trees a sufficient depth of a free soil in which to make a good root system. Subsoiling, if practicable, is also desirable.

When planting the young trees, a good hole, at least 2 feet across and 18 inches in depth, should be dug so that the tap root—which is comparatively long—can be properly set vertically into the ground, and the secondary roots distributed evenly around the plant.

In digging the trees from a seed-bed, care must be taken to remove them as carefully as possible, and to get a good length of the tap root with the plant. If the tap root is injured during digging, care should be taken to cleanly prune off the injured portion above the point of mutilation. If the tap root is too long, it can be pruned back about 8 inches.

It is advisable to soak the bed thoroughly the day before lifting the young trees, as this will make it easier to extract them from the ground without breaking the roots. Loosening the soil by making a trench, 15 to 18 inches deep alongside the rows, will simplify digging.

The trees should be planted in the ground at the same level as they were in the nursery bed, or perhaps a little deeper. Excessively deep planting should, however, be avoided.

The young trees should be well watered at the time of planting and also subsequently should the weather be dry.

On open land, shade should be provided by driving sufficient stakes into the ground around them to support a light hessian or bag cover.

Very often the main stem of the tree is allowed to grow too high before the top is pruned off. This will result in an ungainly, lanky tree.

With the Queensland Nut, as with fruit trees, pruning should aim at producing a sturdy-set tree, well-balanced and fairly open.

The young trees should not be allowed to grow beyond 2 feet in height on a single stem before the top is pruned back. Three side shoots nicely placed are later trained to make the framework of the tree.

Many young trees do not come away well on a single stem, this failure being due to a variety of causes, and a cluster of base shoots may arise as a consequence. It will then become necessary to select the strongest and best-situated shoot to form the tree, the others being cleanly cut away.

No matter whether the trees be planted amongst bananas, pineapples, or other fruits, or in the open, a good stake should be driven alongside each tree, both to protect and support it. Many young trees are destroyed or permanently misshapen by injuries caused during cultural operations, and some protection is clearly necessary.

Where young trees have grown very densely through too many low shoots having been permitted to grow, a certain amount of thinning out of surplus main branches, or of the secondary growths, will be necessary to open up the trees to light and air.

CULTIVATING NEW BANANA LAND.

The benefit to be derived from a thorough breaking-up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas and the thorough breaking-up of the soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need of improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased, or at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

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THE SUGAR BANANA.

The sugar banana has been grown profitably for all the ''bunch'' trade markets in Queensland. Small, sweet, and delicately flavoured, this fruit claims many staunch supporters.

For the production of this banana deep, warm alluvial flats, favoured with a generous rainfall or watered by irrigation, are most suitable. As with other varieties, good drainage is essential. As the sugar banana possesses a slender stem, damage by wind must be guarded against, and where there is no permanent windbreak it is worth while establishing one at the time of planting. For this purpose double border rows of lady fingers or sugar banana plants may be planted 7 feet apart in the row and 7 feet between the rows. The spacings in the inner row should actually lie between the spacings in the outside row—i.e., planted according to the septuple system. These two rows close quickly in towards each other and rapidly form an effective windbreak. Of course, the planting of a permanent windbreak of suitable trees would be far more valuable on account of their permanency, provided the cultivated area is reconditioned from time to time.

Prior to planting, the soil should be worked to a depth of at least 12 inches and reduced to as fine a tilth as possible. The holes for the young plants in the plantation area should be 14 feet apart, 15 inches deep, and 18 inches square. The rows should be lined out as straight as possible each way, thus allowing the greatest convenience in working horsedrawn cultivating implements.

Opinions differ somewhat in the matter of selection of planting material, but generally a vigorous young sucker about 4 feet high dug from a matured stool is most favoured. The top portion of the sucker should be removed, leaving a plant of 3 feet in height to place in the hole. The plant is placed in position within the hole and sufficient surface soil placed in around it to fill approximately two-thirds of the actual cavity. The rest of the cavity is filled in gradually as the ground is cultivated during the ensuing year. According to the quality of the soil, one or two followers are allowed to come away, and, normally, the first bunches will be harvested seventeen or eighteen months after planting.

Farmyard manure applied judiciously to sugar banana plantations will repay the grower handsomely. Light horsedrawn implements are satisfactory for cultivating, and green crops, such as Poona and field peas, are excellent soil invigorators, provided they can be turned back into the soil at the correct time—i.e., when still very soft and succulent.

As the sugar banana is usually marketed in the bunch and the fruit possesses a thin, delicate skin, special care in handling is necessary in order to obtain the best market returns.

PACKING SHEDS AND EQUIPMENT.

In many deciduous fruit districts marketing activities are now at a minimum, and it is now possible to overhaul, repair, replace, and add to the existing packing shed equipment. Many growers carry on, season after season, with make-shift equipment, when, for a little time and a small expenditure of money, a properly-equipped packing shed could be furnished.

Packing stands, nailing-down presses and benches, sizing machines, hammers, stencils, and other equipment should all be gone over and restored to a high state of efficiency. Simple designs for packing stands, nailing-down presses, and case-making benches can be procured, and are not hard to follow by anyone who is useful with a hammer and saw. Simple forms of sizing machines can also be made at home, while those growers who have commercial machines should overhaul them thoroughly, tightening up all screws and bearings, and, if necessary, renewing the padding in the bins and feed channels. Broken parts should be replaced and power plants overhauled. Broken handles in working tools should be renewed. Scrapers and packing needles should be sharpened and greased and packed away until required next season.

Complete sets of new stencils can be cut. A sheet of thin zinc, a small chisel, round, and flat fine-grain files, a hammer, and a piece of end-grain hard wood are the necessary tools. The designs of the letters to be cut can easily be made by obtaining stencils, and copying them on to the zinc in the design wanted. The stencilled letters are then cut out of the sheet of zinc with hammer and chisel, and, in that way, an excellent stencil is made. Stencils are easily obtained, and there is no need to use blue crayon for marking cases.

When the overhauling of plant has been completed, growers should turn their attention to the cleanliness of the packing shed. Old cases and packing-boxes should be repaired or burned, a close inspection of the cracks and crevices being made for pupating insects, such as codling moths. Any shed-stored fruit, which has rotted in the cases, should be removed and destroyed and the cases thoroughly sterilised by completely immersing them in a 5 per cent. solution of formalin for at least one minute. Floors and other parts of the building affected by juice from rotted fruit should also be treated.

Close attention to these details will enable growers to make a clear start at the next harvesting period.

TALL-GROWING VARIETIES OF BANANAS.

The standard commercial banana is the Cavendish, a relatively low-growing form.

Although some of the tall-growing types—such as the Gros Michel, Williams' Hybrid, Vernon, and Mons Marie—have been in cultivation in small areas for a long period, the demand for suckers of these varieties has only recently become of any consequence. In certain favoured localities, they may yet become as popular as the shorter-growing Cavendish.

The fruit of some tall-growing varieties compares favourably with the Cavendish in both size and quality, while their carrying capacity is frequently superior.

Under ordinary conditions, cultural methods applicable to the Cavendish banana can be used for all varieties. They respond to approved desuckering systems used for the Cavendish, and, generally speaking, yield a greater weight of fruit per acre. The returns per acre from tall varieties are thus sometimes better than those received from the more widely grown Cavendish.

PARSNIP-GROWING

Although the parsnip is a native of England and must therefore be classed as a temperate climate vegetable, it may be grown with reasonable success in the tropics during the winter season.

Soil for growing this vegetable should be deep, rich, and free. A good sandy loam gives excellent results. The soil should be prepared some months previously by trenching or cultivating deeply, and incorporating a heavy dressing of stable manure. Organic manures should never be applied in considerable quantities immediately before planting this crop, as they frequently induce forking of the roots. At the end of the wet season the ground should be thoroughly worked up and reduced to a very fine tilth. The seed is then sown thinly and very lightly raked over, after which the soil should be rolled or well packed down with the back of a spade along the drills. The packing is necessary to ensure close contact between the seeds and the soil. A light covering of old horse manure well crumbled or old sawdust will assist germination by preventing the caking of the surface soil.

As soon as the seedlings are well up, thin them out where they are over-crowded, and when about 4 to 6 inches high thin out finally to about 8 inches apart.

Parsnip seed is usually of rather poor germinating capacity, and is practically useless unless quite fresh.

WIND BREAKS FOR BANANAS.

As growers will soon be clearing land to plant fresh areas, the necessity of retaining a belt of scrub about 2 chains wide around new fallings cannot be too strongly stressed. Where the ground is definitely liable to frosting, it is a good plan to make the track through the scrub or forest into the plantation on a zigzag formation. In areas not liable to frosting, wind breaks will greatly assist in keeping out cold winds which chill the plants and thus retard their growth.

Where plantations are already established, growers should give attention to the planting of wind breaks, of which two types are easily made. Lady's Finger or Sugar bananas planted in close formation round the plantation will produce a thicket, and so afford protection. Several border rows of Java cane will also give some protection against frost and wind.

Growers should remember that too much hard work is put into falling scrub, burning off, logging up, and planting areas to excuse the neglect of reasonable precautions against the possible damage to bananas from frost or cold winds, for one severe frosting followed by a warm day will render their plantations worthless.

The Fruit Market.

J. H. GREGORY, Instructor in Fruit Packing.

WITH cold seasonal conditions prevailing, fruit sales have had a tendency to slow up at lower price levels.

Following on the warning given growers in last month's notes, attention is again called to the widespread practice of sending immature fruit to Southern markets. Pineapples, papaws, and bananas often drop in price at this period of the year because of this practice. Queensland growers have almost a monopoly in tropical fruit supplies to Southern markets, so the unwisdom of spoiling a grand opportunity for obtaining the best from the markets is obvious. Competition is said to be the keynote of business, and, probably, Queensland producers of tropical fruits would be more easily persuaded to do the correct thing if there were more competition to meet. In all our fruit production we have always been able to hold our own without trouble in the competitive field, so why not in the commercial sphere?

Ruling market prices during the last week of June, 1940—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 11s. to 16s.; Sixes, 14s. to 16s.; Sevens, 14s. to 21s.; Eights and Nines, 18s. to 22s.

Sydney.—Cavendish: Sixes, 14s. to 19s.; Sevens, 18s. to 21s.; Eights and Nines, 20s. to 27s.

Melbourne.—Cavendish: Sixes, 18s. to 21s.; Sevens, 20s. to 23s.; Eights and Nines, 23s. to 25s.

Lady's Finger.—3d. to 9½d. dozen.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 8s. case; loose, 1s. 6d. to 5s. dozen; Ripley, 4s. to 6s. case; 1s. to 3s. 6d. dozen.

Sydney.—Smoothleaf, 8s. to 13s. case.

Melbourne.—Smoothleaf, 8s. to 12s. case; specials higher.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. tropical case; Locals, 2s. 6d. to 3s. bushel.

Sydney.—8s. to 10s. per tropical case.

Melbourne.—8s. to 12s. per tropical case.

Custard Apples.

Brisbane.—2s. 6d. to 3s. half-bushel.

Monstera Deliciosa.

Brisbane.—2s. 6d. to 4s. dozen.

Strawberries.

Brisbane.—4s. to 10s. dozen cartons.

Sydney.—Trays, 4s. to 9s.; Boxes, 8s. to 16s. dozen.

Avocados.

Brisbane.—6s, to 9s. half-bushel.

Sydney.—8s. to 10s. half-bushel.

Passion Fruit.

Brisbane.—First grade. 7s. to 8s. half-bushel; second, 5s. to 7s. half-bushel.

Melbourne.—9s. to 11s. half-bushel.

OTHER TROPICAL FRUITS.

Cape Gooseberries.—6d. to 7d. lb.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 6s. to 9s. bushel case; Commons, 4s. to 6s. bushel case.

Mandarins.

Brisbane.—Emperor, 4s. to 7s.; Glens, 7s. to 11s.; Scarlets, 4s. to 7s.

Sydney.—Emperor, 6s. to 9s.; Glens, 8s. to 13s.; Scarlets, 6s. to 10s.

Melbourne.—Emperor, 8s. to 10s.; Glens, 10s. to 12s.

Grape Fruit.

Brisbane.—6s. to 9s. per bushel.

Lemons.

Brisbane.—5s. to 10s. bushel.

Sydney.—6s. to 10s. bushel.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 6s. to 12s.; Granny Smith, 6s. to 11s.; Delicious, 6s. to 12s.; French Crab, 5s. to 9s.; Democrat, 6s. to 9s.; Cleopatra, 6s. to 10s.; Sturmer, 6s. to 8s.

Pears.

Brisbane.—Packham's, 6s. to 7s.; Winter Cole, 9s. to 11s.; Glean Morceau, 8s. to 11s.; Winter Nelis, 8s. to 11s.

Tomatoes.

Brisbane.—Ripe, 4s. to 6s.; Green, 2s. to 3s.

MISCELLANEOUS VEGETABLES.

Cucumbers.—10s. to 12s. bushel.

Pumpkins.—4s. to 5s. bag.

Marrows.—1s. to 4s. dozen.

Lettuce.—3d. to 1s. 6d. dozen.

Cabbages.—2s. to 3s. dozen.

Cauliflowers.—4s. to 7s. dozen.

Beans.—*Brisbane,* 4s. to 7s. sugar-bag; *Sydney,* 4s. to 8s. case; *Melbourne,* 4d. to 6d. lb.

Peas.—5s. to 9s. sugar-bag.

Beetroot.—3d. to 9d. bundle.

Parsnips.—9d. to 1s. 6d. bundle.

Carrots.—3d. to 9d. bundle.

Rhubarb.—1s. to 1s. 6d. bundle.

Celery, Local.—1s. to 2s. bundle.

SOUTHERN.

South Australian Celery.—10s. to 15s. crate.

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MILK IN THE HOME—A CORRECTION.

In the article "Problems of Keeping Milk in the Home," by Dr. O. Kudelka, page 553, in the June issue of this Journal, an inadvertent transposition of figures occurred (see page 554, Q.A.J., June, 1940).

Following are the corrected tables:—

Figures for Pasteurised Milk.

	Time Examined.	Atmospheric Temperature. Degrees F.	Bacteria Count.
1	9.0 a.m.	70·3	4,300
2	11.0 a.m.	76·3	7,300
3	1.0 p.m.	77·0	19,000
4	3.0 p.m.	75·9	22,000
5	5.0 p.m.	73·8	122,400
		Refrigerator Temperature. Degrees F.	
6	5.0 p.m.	56·0	2,900

Figures for Raw Milk.

No.	Time Examined.	Atmospheric Temperature. Degrees F.	Bacteria Count.
1	8.30 a.m.	67·9	12,000
2	10.30 a.m.	70·2	164,000
3	12.30 p.m.	71·0	920,000
4	2.30 p.m.	70·7	1,200,000
5	4.30 p.m.	69·0	2,960,000
		Refrigerator Temperature. Degrees F.	
6	4.30 p.m.	56·0	14,000

Sugar Levies.

(Abbreviated Notice.)

1940 SEASON.

Regulations under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1938," have been approved, providing for levies on suppliers of cane to sugar-mills at the following rates for the season 1940 [the figures for 1938 and 1939 are given for comparison purposes]—

Name of Mill.	General Levy by Queensland Canegrowers' Council.	Administrative Levy by District Executive.	Administrative Levy by Mill Suppliers' Committee.	Special Levy by Mill Suppliers' Committee.	Total Levies for 1940.	Total Levies for 1939 given for comparison	Total Levies for 1938, given for comparison.
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Mossman Central	¾	1½	..	..	2¼	2½	2
Hambledon	¾	¼	¼	..	1¼	1	1¼
Babinda Central	¾	¼	⅛	..	1⅛	⅞	1$\frac{1}{16}$
Mulgrave Central	¾	¼	..	.	1	¾	1
South Johnstone Central	¾	1½	⅛	.	2⅜	2	2¼
Goondi	¾	1½	..	.	2¼	2	2¼
Mourilyan	¾	1½	..	.	2¼	2	2¼
Tully River Central	¾	1¾	..	..	2½	2¼	2½
Macknade	¾	¾	¾	..	2¼	1½	1¾
Victoria	¾	¾	¾	..	2¼	1½	1¾
Kalamia	¾	..	1	¼	2	2	1¾
Pioneer	¾	..	1	½	2¼	2¼	2¼
Inkerman	¾	..	¾	..	1½	1	1¼
Invicta	¾	..	1	..	1¾	2	2¼
Proserpine Central	¾	1	..	..	1¾	1½	1¾
Cattle Creek Central	¾	⅜	¼	..	1⅜	1½	1¾
Plane Creek Central	¾	⅜	½	..	1⅝	1⅜	1⅝
Marian Central	¾	⅜	¼	..	1⅜	1½	1¾
North Eton Central	¾	⅜	½	..	1⅝	1	1¼
Pleystowe	¾	⅜	1	½	2⅝	1¾	2
Racecourse Central	¾	⅜	½	..	1⅝	1½	1¾
Farleigh	¾	⅜	¼	..	1⅜	1½	1¾
Qunaba	¾	½	¼	..	1½	2¼	2¾
Bingera	¾	½	½	..	1¾	2¼	2¾
Fairymead	¾	½	½	..	1¾	2½	3
Gin Gin Central	¾	½	¾	..	2	2½	3
Millaquin	¾	½	¼	..	1½	2	2½
Isis Central	¾	½	..	..	1¼	1	1¼
Maryborough	¾	½	½	½	2¼	1¼	1½
Mount Bauple Central	¾	½	¼	..	1½	1¼	1½
Moreton Central	¾	..	1	½	2¼	2¼	2¾
Rocky Point	¾	..	¾	..	1½	1½	1¾
Eagleby	¾	..	..	..	¾	1½	1

No poll will be taken in respect of the General Levy of ¾d. per ton (first column) for the Queensland Cane Growers' Council, or for the administrative levies by District Executives or Mill Suppliers Committees (second and third columns).

In the fourth column, the levies on cane supplied to the Kalamia, Pioneer, Pleystowe, Maryborough, and Moreton Central Mills will be used in defraying the costs of employing farmers' representatives at those mills for the current season. In the case of these levies, growers may petition for a poll, and the petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the growers who are suppliers of cane to the five mills concerned.

In addition to the foregoing levies, the undermentioned Mill Suppliers' Committees are empowered to make particular levies on growers within each of the following districts, at the following rates:—

Name of Mill Suppliers' Committee and Mill to which Cane is Supplied.	Description of District upon the Growers wherein Levies will be made and description of Cane upon the Growers whereof Levies will be made.	Amount of Levy per ton of Cane Supplied.	Purposes of Levy.
		d.	
Isis Central ..	All cane consigned on the railway by Government trucks from Booyal, Junien, and Marule Sidings on the Dallarnil railway.	¼	To be used for administrative purposes by Booyal Branch of Isis Central Mill Suppliers' Committee.
Mount Bauple Central	Yerra-Mungar district within the boundaries of the parishes of Gungaloon, Denison, Doongul, Woocoo, and Young	¼	To be used for administrative purposes by Yerra-Mungar District Branch of Mount Bauple Mill Suppliers' Committee.
Maryborough ..	That part of the Pialba district within the boundaries of the parishes of Urangan, Vernon, and Bingham, county March	1	To be used for administrative purposes by the Pialba District Branch of Maryborough Mill Suppliers' Committee.
Maryborough ..	Maryborough district within the boundaries of the parishes of Tinana, Maryborough, Bidwell, Elliott, Young, and Walliebum, county March	¼	To be used for administrative purposes by Maryborough District Branch of Maryborough Mill Suppliers' Committee.
Racecourse Central	All cane hauled over the Silent Grove tramline	2	To defray the costs of employing a farmers' representative of the section of growers concerned at the Racecourse Mill for the current season.
Marian Central ..	All cane loaded at Dow's Creek and Langdon Sidings	½	To be used for insurance and weighbridge maintenance by the Dow's Creek and Langdon Branch of the Marian Central Mill Suppliers' Committee.
Gin Gin Central ..	All cane delivered at Morganville Railway Station by growers in the Goodnight district	½	To defray the cost of maintaining a loading derrick at Morganville Railway Station by the section of growers concerned.

Growers are given the opportunity of petitioning for a poll to decide whether or not the above levies shall be made. The petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the growers who are cane suppliers within any of the areas concerned.

All petitions must reach the Secretary for Agriculture and Stock, Department of Agriculture and Stock, Brisbane, on or before the 15th July, 1940.

Full particulars of these Regulations appear in the *Government Gazette* of the 13th June, 1940, or may be obtained on application to the managers of the various sugar-mills in Queensland or to the undersigned—

R. P. M. SHORT, Under Secretary,
Department of Agriculture and Stock,
Brisbane.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production charts for which were compiled during the month of May, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (STANDARD, 350 LB.).				
Nellie 4th of Alfa Vale (365 days)	W. H. Thompson, Alfa Vale, Nanango	23,889·3	889·754	Reward of Fairfield
Alfa Vale Laura	W. H. Thompson, Alfa Vale, Nanango	19,752·65	718·55	Reward of Fairfield
Applegarth Jill	J. A. Heading, Highfields, Murgon	14,339·2	459·385	Hillcrest Duke
Glengarry Gem	G. Waugh, Glengarry, Peeramon	10,969·4	428·236	Jean 7th's Prince of Blacklands
SENIOR 4 YEARS (STANDARD 330 LB.)				
Blacklands Jennie 9th	T. Ryan, Allora	10,272·5	353·749	Hillview Daphne's Reform
JUNIOR, 4 YEARS (STANDARD, 310 LB.).				
Highfields Princess 4th	J. A Heading, Highfields, Murgon	9,981·35	384·644	Headlands Hero
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Navillus Vera 7th	Con. O'Sullivan, Navillus, Ascot, Greenmount	11,267·2	415·41	Alfa Vale Re Nell
Braemar Merry Maid	W. Henschell, Yarranvale, Pittsworth	9,119·76	393·888	Jamberoo Banker 15th
Springleigh Red Rose 5th (229 days)	H. F. Moller, Boonah	9,313·00	390·652	Burradale Roland
Springleigh Red Rose 4th	H. Moller, Springleigh, Boonah	8,411·00	328·26	Greyleigh Governor
Arolla Gentle	J. Crookey, Allora	7,404·4	318·398	Navillus Rosebud Sheik
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Sunnyview Bess 6th	J. Phillips and Sons, Sunnyview, Wondai	9,772·5	362·184	Sunnyview Commodore
Claredale Duchess	W. Henschell, Yarranvale, Pittsworth	9,451·86	351·126	Wilga Vale Royal Lad
Claredale Lovely	W. Henschell, Yarranvale, Pittsworth	9,477·56	321·847	Wilga Vale Royal Lad
Penrhos Elva 6th	Alex. Sandilands, junr., Penrhos, Wildash	6,540·16	306·796	Penrhos Blossom Prince
Pilton View Olga 4th	P. D. Fiechtner, Ascot, Greenmount	6,346·1	284·253	Navillus Venie's Sheik
Claredale June II. (223 days)	W. Henschell, Yarranvale, Pittsworth	8,231·69	279·828	Wilga Vale Royal Lad
Rosehill Stella 2nd	W. Flesser, Boyland	7,541·6	271·981	Dnalwon Count

JERSEY.

MATURE COW (STANDARD, 350 LB.).

Cream Lass of Calton	L. J. Comiskey, Warra	10,209·8	605·907	Retford Meteor
Trecarne Chimes 2nd	T. A. Petherick, Lockyer	8,773·95	518·188	Trecarne Golden King
Glenview Hawthorn	F. P. Fowler and Son, Glenview, Coalstoun Lakes	10,514·95	469·276	Trinity Governor's Hope
Trinity Lady Victoria	J. Sinnamon and Sons, Moggill	8,446·36	381·614	Some Hope
Trinity Dreaming Darling	J. Sinnamon and Sons, Moggill	7,599·61	374·477	Trinity Dreaming Pioneer
Trinity Joyful Lady	J. Sinnamon and Sons, Moggill	7,718·16	374·257	Some Hope
Trinity Gallant Lady	J. Sinnamon and Sons, Moggill	7,288·28	365·303	Some Hope
Glenview Tinkle Bell	F. P. Fowler and Son, Glenview, Coalstoun Lakes	7,552·15	356·026	Trinity Governor's Hope

SENIOR, 4 YEARS (STANDARD 330 LB.).

Westbrook Tulip 63rd	Farm Home for Boys Westbrook	8,921·55	414·613	Trinity Ginger Boy
Trinity Lady Gleam	J. Sinnamon and Sons, Moggill	8,505·67	362·542	Some Hope
Ladybird of Hopeview (240 days)	H. T. C. Gibson, Kingaroy	6.167·05	340·859	Lady's Reminder of Hopeview

JUNIOR, 4 YEARS (STANDARD, 310 LB.).

Brooklands Royal Chimes	N. C. Webb, Beaudesert	8,450·65	479·315	Retford Earl Victor
Westbrook Sweet Suey 2nd	Farm Home for Boys, Westbrook	8,785·00	421·638	Oxford Golden Dreamer
Westbrook Tulip 68th	Farm Home for Boys, Westbrook	6,994·2	367·261	Oxford Gem's Ambassador

SENIOR, 3 YEARS (STANDARD, 290 LB.).

Trecarne Dairy Maid	T. A. Petherick, Lockyer	8,718·5	495·957	Trinity Some Officer
Brooklands Royal Babette	N. C. Webb, Beaudesert	8,718·75	452·313	Retford Earl Victor
Hopeview Duchess	H. T. C. Gibson, Kingaroy	7,115·08	401·404	Reminder of Calton
Glenview Rosalyn	F. P. Fowler and Son, Glenview, Coalstoun Lakes	7,497·4	382·652	Trinity Governor's Hope
Glenview Sweet Sultane	F. P. Fowler and Son, Glenview, Coalstoun Lakes	7,047·15	371·937	Trinity Governor's Hope

JUNIOR, 3 YEARS (STANDARD, 270 LB.).

Cooeeall Belle	E. G. Rothery, Ringarooma, Archer	7,404·7	413·122	Booser of Cooeeall
Trinity Noble Hazelette	J. Sinnamon and Sons, Moggill	7,804·39	403·941	Trinity Nobly Born
Trinity Mountain Fern	J. Sinnamon and Sons, Moggill	5,639·73	287·594	Trinity Royal Sovereign

General Notes

Staff Changes and Appointments.

The undermentioned inspectors under *The Diseases in Stock Acts, The Slaughtering Act*, and *The Dairy Produce Acts*, Department of Agriculture and Stock, have been appointed also inspectors under *The Brands Acts*, as from the 15th June:—G. K. L. Clark, V. Kleinschmidt, D. S. Robertson, W. F. Snewin, A. H. Strohfeldt, E. J. Taylor.

Constable T. H. Widt, of Lowood, has been appointed also an inspector under *The Brands Acts.*

A. Carpenter, S. J. Claydon, J. N. Sutton, B. G. Weber, and G. Frankham, relieving officers of the Stock Branch, Department of Agriculture, New South Wales, have been appointed also inspectors under *The Diseases in Plants Acts.*

The appointment of Mr. S. O. D. Arthur, Yelarbon, as honorary protector under *The Fauna Protection Act*, has been cancelled.

Mr. A. F. Moodie, dairy inspector, at present attached to Mackay, is to be attached to Hughenden.

Mr. R. W. Bambrick, inspector of stock, at present attached to Hughenden, is to be attached to Gayndah.

Mr. C. R. Tummon, slaughtering inspector, at present attached to Oxley Bacon Factory, is to be attached to Mackay.

Mr. S. M. Seamer, inspector of stock, at present attached to Wandoan, is to be attached to Boondooma.

Mr. E. C. Dunn, inspector of stock, at present attached to Boondooma, is to be attached to Wandoan.

Mr. T. J. Donohue has been appointed an assistant cane tester at Babinda.

Mr. J. G. Auld, of Maryvale, Warwick, has been appointed an honorary ranger under *The Native Plants Protection Act* and honorary protector under *The Fauna Protection Act.*

Protection of Native Plants.

An Order in Council has been issued under "*The Native Plants Protection Act of 1930*," declaring that all species of the native plants helichrysum and helipterum (everlastings) shall be protected under the abovementioned Act throughout the whole State of Queensland for an unlimited period.

Mill Suppliers' Committees and District Executives.

The regulations in force under the Primary Producers' Organisation and Marketing Acts relating to the election of mill suppliers' committees and district canegrowers' executives have been revised, and the regulations in their amended form will provide for optional preferential voting in respect of future elections of these committees and executives.

Gumming Disease of Sugar Cane.

A Proclamation has been issued under "*The Sugar Experiment Stations Acts,* 1900 *to* 1938," declaring portion of the Hambledon mill area to be a quarantine area in respect of gumming disease of sugar-cane. The nature of the quarantine shall be the prohibition of the removal from such area of any sugar-cane (except for milling purposes at the Hambledon mill) unless written permission has been granted by the Minister or an inspector.

Grant to Wheat Growers.

An Order in Council has been issued under "*The Wheat Stabilisation Act of* 1938," determining that the basis on which the moneys granted to the State by the Commonwealth Government by way of financial assistance shall be distributed shall be a payment to each wheatgrower (in addition to payments already made) of 74/75ths of a penny per bushel of wheat harvested on or after the 1st October, 1938, which has been sold or delivered for sale during the year ended 30th December, 1939.

Orders in Council issued in May and November last provided for payments of 2d. and 1 9/16d. per bushel, respectively.

Answers to Correspondents

Starr Burr—A Bad Weed Pest.

H.P. (El Arish)—

The specimen is Starr Burr (*Acanthospermum hispidum*), a native of tropical America, now naturalised in North Queensland, and one of our worst weed pests. In some parts of North Queensland it is called Bindy-eye, but the use of this name is wrong, as it belongs more correctly to a different plant altogether, a native of Western Queensland. So far as we know, the plant has not been declared a noxious weed within your Shire, and if you desire to have it so declared you should make a request to your local shire office. It has been gazetted in a number of northern shires. We have seen the plant as far south as Brisbane, but it does not seem to gain a hold here as it does in the northern parts of the State.

The plant should succumb fairly readily to spraying with weak arsenical solutions, but these are poisonous to stock.

Jaragua Grass.

G.B.B. (Rockhampton)—

We were very pleased to receive the specimens of Jaragua grass. They represent *Hyparrhenia rufa*, a native of tropical Africa and introduced into Brazil. The Index Kewensis gives its distribution as tropical Africa and South America, but we think most authorities agree now that the plant is an introduction into the latter country, in spite of the fact that it is so common there, and the outstanding grass in Southern Brazil and Paraguay. It has been introduced into Queensland at odd times both from South America and from Africa. Of course, it is very hard to judge from appearances, but we should hardly think the grass as good as some of our native sorts, such as the Forest Blue Grass (*Bothriochloa intermedia*), which it resembles somewhat in growth.

White Spear Grass.

A.V.B. (Brookstead)—

The specimen is the white spear grass (*Aristida leptopoda*), a grass with a very wide distribution in Queensland on the black soil flats, and a menace in many localities. The grass belongs to the genus *Aristida*, represented by a number of species in Australia, mostly in Queensland, and of very poor fodder quality. The present one is perhaps the best of a bad group and has a certain amount of fodder value in its young stages. Probably the only means of controlling it would be cultivating the ground and sowing with a better species, such as Rhodes Grass.

We hesitate to recommend winter grasses under Queensland conditions, but think you might try *Urochloa panicoides*, with and without ploughing. This grass has become very abundant on the Downs during the last few years, and has gained some reputation as a control of mint weed. Seed is not stocked by nurserymen.

A Poisonous Plant—Cestrum Parqui.

H. (Wilston)—

Your specimen is Green Cestrum, *Cestrum Parqui*, a native of Chile and the Argentine, now a common naturalised weed in Queensland. It is abundant in vacant allotments in Brisbane. It is very poisonous to stock, and we have had several cases of dairy cows having been killed by it. It has been gazetted a noxious weed throughout the State.

Hairy Indigo.

H.S.B. (Mundubbera)—

The specimen is Hairy Indigo (*Indigofera hirsuta*), a native of Eastern Australia, but with a very wide distribution in tropical Asia and Africa. In Queensland it is commonly seen as a weed of old cultivation areas, but is not confined to such places. It is very common in the central district, particularly about Rockhampton, but we have had reports from there that stock, especially horses, are quite fond of it. Some of the indigos are useful herbs in the mixed native pasture in Northern Queensland, but we are rather doubtful about the value of the present one.

Rural Topics

Drought Feeding of Sheep.

Here is the experience of a Queensland grazier who has had a lot to do with feeding sheep in dry times. He favours the automatic system of feeding instead of the old "feeding the fowls" maize method. In the last prolonged dry spell in his district he saved his sheep and marked 100 per cent. of lambs as a result of "automatic" feeding, plus, of course, sound and careful management. He fed his sheep from log troughs at the rate of 2½ oz. a day on a variety of mixtures, and under the guidance of a stock nutritional adviser. Amongst the ingredients of the mixtures used were cottonseed meal, calphos bone meal, salt, molasses, barley meal, wheat meal, and meat meal.

His belief in self-feeding by sheep in a dry time is based on these reasons—

> No mustering (you don't knock your sheep about and run their energy off); lower labour cost; less cost for material feed; and greater improvement in the condition of the sheep.

How Fruit Growers Save Soil and Water.

Contour planting is just as effective in the orchard as in the paddock as a means of conserving soil moisture and preventing erosion. Experiments in hilly country in parts of Queensland and of New South Wales have given abundant proof of this fact.

Orchardists have quickly realised the benefits to be derived by following the system. Until a few years ago orchards, irrespective of location, slope of the land, and other features, have been planted on the square, or on some similar method. This had the effect of quickening the run-off of rain water and consequent loss of soil. If land is to retain its productivity, the soil must be maintained—especially that thin layer of top soil.

Contour planting definitely prevents—or at least minimises—loss of soil by erosion and ensures the retention of moisture in both soil and subsoil. In New South Wales, contour-planted orchards are the rule in all the main tableland fruit-growing regions. Apart from new orchards planted on the contour, many growers have established contour banks in old orchards, realising that the conservation of soil is of paramount importance. As time goes on, the results from contour planting and contour banking will be reflected in improved health, productivity, and life of the fruit tree.

More Salt for Horses.

One occasionally hears farmers complain that their animals chew rags, sticks, old car batteries, and other material that may be lying around. One farmer tried to sue the Canadian Government because his heifer died from licking a freshly-painted surface. The Government officials replied that he would not have lost his heifer if he had kept her supplied with a mixture of salt and sterilised bonemeal. In all these cases, the animals are trying to supply their systems with some mineral substances which have not been supplied by their owners.

It would seem that in view of the great value, low cost and ease with which salt can be obtained, regular and sufficient supplies for live stock should always be made available. However, the fact remains that a correct and regular ration of salt is often forgotten, and, unfortunately, live stock have no way of expressing their desires other than by manifesting some symptoms like licking freshly-painted fences, chewing bones, or swallowing metal odds and ends—or by decreased efficiency in production.

During hot summer weather, working horses are frequently subject to very trying conditions. One of the most frequent causes of lowness in condition and undue fatigue in horses is due, primarily, to a lack of recognition of needed salt requirements. Horses should be allowed access to salt at all times. A very satisfactory idea is to keep a salt block under cover in the paddock, and, in addition, it is a good thing to provide, say, a block of salt in each manger. Otherwise, a tablespoon full of salt may be added to the horse's feed. Few farm animals will eat too much salt if given free access to it. Only a salt-starved animal will eat more than it should. Often, a finicky feeder and shy drinker will show increased appetite when allowed free and regular access to salt.

Farm Notes

AUGUST.

AUGUST is normally a dry month throughout the State, but where good soil moisture exists the coming of warmer weather will cause an increase in weed growth, necessitating the use of cultivators in growing crops and the land being prepared for maize, cotton, sorghums, and other crops.

Well-worked land having reserves of subsoil moisture is essential for satisfactory subsequent growth, as spring-sown crops often have to withstand moderately dry conditions until the occurrence of early summer storms.

In coastal districts where frost is not liable to occur, early sowings of maize, sorghums, millets, sudan grass, pumpkins, and melons may be made. Arrowroot, artichokes, and sweet potatoes also may be planted, but unless ample soil moisture is present, there is little to be gained by very early sowings before the soil is sufficiently warm, as later-established areas will often make rapid growth, equalling or excelling that of earlier sowings.

Potato planting will be commencing in the Downs, South Burnett, and other areas away from the coast, where July plantings are likely to be affected by frost, the bulk of the spring crop being established during July and August.

Potatoes thrive in thoroughly prepared virgin soils, more especially deep, friable well-drained alluvial loams and scrub soils, which indicates that the maintenance of a supply of humus in the soil is essential for profitable yields.

Seed potatoes for this crop are usually obtained from the Southern States, where certified seed true to varietal type is now available, but, to prevent seed-borne disease, all seed should be treated either by the hot formalin or corrosive sublimate methods, full particulars of which are obtainable from the Department. Whole sets are preferable, but cut sets may be used for the spring planting, dusting the cut surfaces with wood ashes or slaked lime shortly after cutting.

Dairy farmers in many districts will now be utilising early sown winter fodder crops to maintain production, and where crops are grazed, temporary subdivision will prove valuable in conserving growth and providing fresh pastures at frequent intervals.

On the Downs the grazing of wheat areas, intended ultimately for grain, should have ceased by late July, otherwise probable yields are likely to be considerably reduced.

QUEENSLAND SHOW DATES FOR 1940.

The Queensland Chamber of Agricultural Societies has issued the following list of show dates for 1940:—

JULY.

Ayr	12th and 13th
Rosewood	12th and 13th
Cleveland	12th and 13th
Townsville	16th to 18th
Maleny	18th and 19th
Charters Towers	29th to 31st
Gatton	23rd to 25th
Innisfail	25th, 26th, and 27th
Caboolture	26th and 27th
Atherton Show	30th and 31st
Crow's Nest	31st and 1st August
Maleny Show	abandoned for 1940

AUGUST.

Home Hill	2nd and 3rd
Pine Rivers	2nd and 3rd
Royal National, Brisbane	12th to 17th

SEPTEMBER.

Imbil	6th and 7th
Canungra	7th
Pomona	13th and 14th
Rocklea	14th
Malanda Show	18th and 19th
Beenleigh	20th and 21st
Ithaca	28th

OCTOBER.

Warwick Rodeo	5th and 7th

Orchard Notes

AUGUST.

THE COASTAL DISTRICTS.

Last month's notes are repeated.

CITRUS fruits, with the exception of the late-ripening varieties, will have been harvested by now, and cultural operations should be receiving attention.

Trees which show indications of impaired vigour will require a somewhat heavy pruning both in respect to thinning and shortening the branches. Where the trees are vigorous and healthy a light pruning only will be necessary, except in the case of the Glen Retreat mandarin. The densely-growing habit of this variety leads to a profusion of weak shoots, which, if allowed to develop, will cause overbearing with resultant small and inferior fruit at an early age.

Where trees show signs of failing, look for collar rot at or near ground level. The roots should be examined for disease, and in the North Coast districts for the citrus root bark channeller. A light application of paradichlorobenzene buried a few inches deep in circular drills around the tree and with the surface stamped firmly has been recommended for controlling this pest. The distance between the circular drills should be not more than 18 inches, and care should be taken to prevent the crystals of paradichlorobenzene from coming into contact with the roots. It may be necessary to repeat the application after an interval of three or four weeks.

Where it is necessary to control brown spot of the Emperor of Canton mandarin, black spot, melanose, and scab, the fungicide should be applied at the correct time. The control measures recommended are—

For Brown Spot.

Home-made cuprous oxide mixture (3-80)—
(1) At ½ to ¾ petal fall (i.e., as soon as the majority of the fruit has set)
(2) Two months later.
(3) In late February.

For Black Spot.

Home-made cuprous oxide mixture (3-80)—
(1) At ½ to ¾ petal fall.
(2) Two months later.

For Melanose and/or Scab.

Home-made cuprous oxide mixture (3-80)—
(1) At ½ to ¾ petal fall.

Certain applications of these copper sprays may be combined with various insecticides and mixtures to correct mineral deficiencies, such as zinc. Information regarding these mixtures can be obtained from this Department.

Where for any reason healthy trees of vigorous constitution are unprofitable, they may be headed back—in fact, have the whole of the top removed—leaving a few selected arms. All other branches should be cut away at their source of origin. The three or four remaining arms, of which lengths will vary from 2 to 4 feet, will form the future framework of the tree. Care must be taken to cover the whole of the exposed bark with a suitable coating of whitewash to prevent sunburn. The numerous shoots which will grow from main arms should be suitably reduced, leaving from two to four on each arm. Under favourable conditions, these will be in a fit condition to receive selected buds from desirable trees by the following autumn. It is desirable that when shoots intended for budding have attained a length of from 6 to 9 inches, their terminals should be nipped off in order to stiffen their growth and guard against the possibility of damage by strong winds.

Fertilizing should be finished as early as possible, the mixture for the spring application being high in readily available nitrogen. Ploughing should then be completed, the depth being regulated by local conditions and the nature of the original preparation of the land. After the ploughing, the land should be worked down to a fine state of tilth. On hillside orchards, attention should be given to the control of possible storm waters. Cultivation should be so arranged as to form shallow drains or banks along the tree rows and across the heaviest slope, leading into suitable side drains which may be grassed to prevent erosion.

The planting of trees may be continued and, with the exception of custard apples, expedited. The attention of citrus growers should be confined to varieties suited to their local conditions.

The pruning of grape vines should be completed, and where cuttings for planting are required these should be selected, trimmed, and heeled-in in slightly dry soil. Canes intended for cuttings should not be allowed to lie about and dry out, but should be treated the day they are severed from the plant. Cuttings are frequently made too long. From 10 to 12 inches is a suitable length which allows for insertion in the soil so as to permit of the top bud, with a short section of the internode, protruding above the surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be finished this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. When there are indications of the swelling of the buds, the time is opportune for working over unprofitable trees, where the stock is reasonably vigorous. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted, deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and whether any effort is being made towards raising a local supply of nursery stock.

HOW THE FARMER FEEDS THE ARMY.

Many thousands of young Queenslanders have gone into camp for an extended period of military training, and everyone has brought with him a very healthy appetite. Any good cook will tell you that the most direct route to a man's heart is through his ''tummy.'' As laid down by Napoleon, an army marches on its stomach; in other words, success for the soldier comes from being well fed.

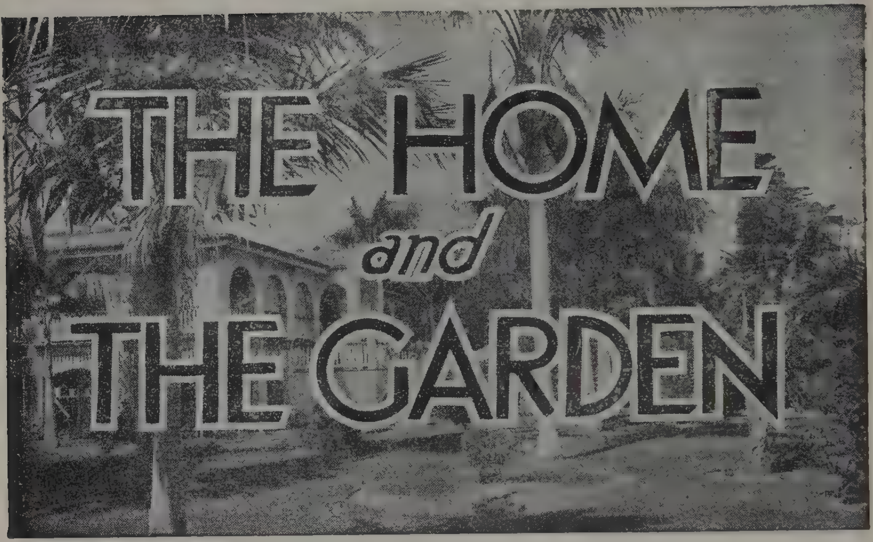
The Diggers of to-day have the advantage of all the recent discoveries of those whose job it is to make a scientific study of food values.

In each of the camps, standard menus have been arranged according to the foods available in seasonable supply. Included in every bill of fare are eggs, bacon, many kinds of vegetables, beef, mutton, fruit, cheese, milk, and butter. Apples, oranges, lettuce, tomatoes, and beetroot for cold salads are supplied regularly to every mess. Butter is on the mess tables at two meals every day. Selected men have been trained as cooks, and a chief instructor in cooking is attached to each camp.

It will be comforting, too, to the relatives and friends of the young soldiers to know that the camps are now equipped with cold storage for perishable foods, and no effort is being spared to feed the men well and safeguard their health in every possible way.

Going through the menu for each meal in camp it will be observed how much our potential defenders depend on the farm for their all-round efficiency.

In Queensland, no less than in the Old Country, our success in the war depends on the industry of our primary producers, and although the plough is the accepted symbol of the peace for which we are striving, it also is, paradoxically, one of our most powerful weapons of war.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

CLOTHES AND SHOES FOR THE OLDER CHILD.

IN our article last month we talked about clothing the youngest member of the family—this month we shall give some consideration to suitable clothing for the just-as-important older brother or sister. Many of the clothes worn in childhood may delight the eye, but they are not always simple and practical enough to be comfortable, and they sometimes ignore the fact that the main purpose of clothing is to keep the body warm.

The toddler should be dressed in loose, light, comfortably-fitting garments without elastics or tapes, and they should allow for complete freedom of movement. Clothing which is too heavy will tend to limit movement and make the child easily tired, so even winter clothing should be light in weight. Toddlers' clothes should hang from the shoulders and be easy to put on and take off, so that the child may learn to undress himself. This he should be taught to do by the time he is four years of age. Children like doing things for themselves, and so buttons and other fastenings should not be too difficult for tiny fingers to deal with. The clothes should be simple to wash and iron, because with a happy healthy child they may have to be changed several times a day. They should not be expensive, because then mother will "fuss" over them, and so limit the child's activities and worry him unnecessarily. It is no use supplying expensive clothes for a small person who, we hope, will grow normally and very soon grow right out of them. And while on this business of growing, do not forget to provide extra width and length for the child's filling out. Plenty of room should be allowed at the armholes so that he may use his arms freely, and planty of room in the fork of small trousers or panties. It is not uncommon to see small children, particularly boys, who suffer from irritation and soreness because their rompers or trousers are so short in the leg and hitched up so tightly round the waist that the seams rub them in the fork.

Stockings should be made of wool as a rule and should have square toes and fit easily. In summer they can be quite short, but in winter it is better to have them long enough to pull up to the knees. It is a very foolish practice, and one frequently observed, that a mother muffles up a small child's body in winter in heavy overcoat and scarf, but has skirts or knickers so short, and cotton socks so brief, that the whole of the child's legs are bare, cold, and blue. Leggings or gaiters can be worn in winter when the weather is really cold or wet.

Making Clothes for Toddlers.

Overcoats.—These must be light in weight, porous, warm, and washable in all cases. They should be double breasted to allow of letting out later, and fur and other trimmings should be avoided. Armholes should be large and well cut. An inverted pleat at the back or a flared skirt allows room for movement and sitting.

Dresses for Toddlers and Little Girls.

Materials:

For cold weather.—Viyella, wool, voile, or any other good woollen, wool and cotton, or wool and silk material.

For hot weather.—Washing cottons, silk, or artificial silk.

The dresses should have good turnings for lengthening the skirt and bodice, and also at the side seams and sleeve seams. Avoid tight armholes and wrist bands. Necks should be fitted carefully, and should never have draw strings, and elastic should never be used to hold up a puffed sleeve. Short magyar sleeves cut in one with the bodice are cool and comfortable, and epaulette sleeves are suitable for muslin or other light material. Warm dresses should have long sleeves gathered into wristbands. Button and buttonholes make the best fastenings.

Knickers for Little Girls.

These are often made to match the dresses, although artificial silk stockinette in summer and silk and wool stockinette in winter are also recommended. Pure wool stockinette tends to thicken with washing and is unnecessarily warm. The back of the knickers must be cut longer and slightly wider than the front to allow ample room for bending and sitting. Avoid elastic at waist and knees. It is not necessary for a knicker waist to be tight enough to hold the garment in place. The knickers should be attached to a liberty bodice by means of buttons and buttonholes.

Liberty Bodice.

Aertex cellular cotton is an ideal material for a liberty bodice, as it is porous and easily washed. Avoid heavy calico. Double material is unnecessary. The bodice should fit the child's figure loosely and should extend well below the waist. Stitch bands of wide tape along the whole length to take the strain at all points where garments are buttoned on to it. It is most important that there should be two sets of knicker buttons on the bodice, the one above the other, so that the length may be adjusted for use with knickers which vary in size.

(To be continued next month.)

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N.1, Brisbane.

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IN THE FARM KITCHEN.

FOR WINTER MENUS.

Apricot Short-cake.

Sift 2 level cups plain flour, 4 level teaspoons baking powder, ½ level teaspoon salt, and 2 level tablespoons castor sugar. Beat 1 egg and add to ½ cup milk. Rub 3 level tablespoons butter into dry ingredients and form into a soft dough with the milk. Divide mixture into two equal parts. Press one part into a well-greased and floured sandwich tin.. Spread with butter, then cover with the remaining dough, which must be rolled out smoothly to fit the tin. Bake in a hot oven for about twenty-five minutes. While still hot, split through the middle and spread with apricot jam, to which is added 1 tablespoon whipped cream and a few finely-chopped almonds. Join together and sprinkle well with icing sugar.

Raspberry Muffins.

Sift together 1½ level cups plain flour, 2½ level teaspoons baking powder, ½ level teaspoon salt; add ¼ cup sugar. Beat 1 egg well, add 1 cup milk and 2 level tablespoons butter (melted), mix lightly and place a little in a well-greased and floured patty or small muffin pan, add 1 teaspoon raspberry jam, then place another spoonful of mixture on top. Bake in a hot oven for about twenty minutes.

Jam Rollettes.

Sift 2 cups flour, 4 level teaspoons baking powder, a good pinch salt. Rub in 2 level tablespoons butter, add 1 tablespoon sugar. Beat 1 egg well, add ¾ cup milk, and then add it to dry ingredients, forming it into a soft dough. Flatten out to about ¼ inch thick; spread with jam, roll up, and cut off pieces about 1 inch thick. Place in well-greased and floured patty pans and bake in a hot oven for about fifteen minutes. Dust with icing sugar and serve with boiled custard.

Baked Jam Roll.

Sift 8 oz. flour, 1 level teaspoon baking powder, and a pinch salt together; rub in 5 oz. butter until mixture looks like fine breadcrumbs. Form into a firm dough with about ½ cup water. Roll out and spread with jam, roll up and place in a well-greased loaf-tin and bake in a moderate oven for about forty-five minutes.

Baked or Steamed Jam Sponge.

Place 2 tablespoons jam in a well-greased basin for boiling or a round cake-tin for baking. Sift 1¼ level cups plain flour, 1½ level teaspoons baking powder, ¼ teaspoon salt, and ½ cup castor sugar. Beat 1 egg well and add ½ cup milk, a little essence to taste. Add this to flour, beating well all the time. Melt ¼ cup butter, add to mixture, and beat until creamy. Pour into prepared moulds and bake in a moderate oven for about forty-five minutes or steam for one hour.

Steamed Jam Roll.

Chop 4 oz. suet finely; sift 8 oz. flour with 1½ teaspoons baking powder and a good pinch salt. Add 1 tablespoon fine white soft breadcrumbs and prepared suet. Form into a firm dough with a little water or milk. Knead a very little. Roll out and spread with apricot jam, sprinkle with a few chopped walnuts or coconut. Roll up and place in a greased nut loaf tin. Cover with greased paper and steam for one and a-half hours. Turn out and serve with a light cream sauce.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1940 AND 1939, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1940.	May, 1939.
North Coast.	In.		In.	In.
Atherton	2·24	39	3·56	2·69
Cairns	4·47	58	2·38	2·63
Cardwell	3·58	68	3·44	1·55
Cooktown ..	2·77	64	0·99	1·04
Herberton ..	1·70	54	2·35	0·80
Ingham	3·70	48	4·00	2·43
Innisfail	12·37	59	7·51	11·33
Mossman Mill ..	3·67	27	2·28	0·96
Townsville ..	0·95	69	0·16	0·45
Central Coast.				
Ayr	1·06	53	0·28	0·12
Bowen	1·25	69	0·79	0·60
Charters Towers ..	0·76	58	0·29	0·23
Mackay P.O. ..	3·82	69	2·05	6·28
Mackay Sugar Experiment Station	3·41	43	1·18	7·11
Proserpine ..	4·20	37	2·82	3·46
St. Lawrence ..	1·74	69	0·34	0·75
South Coast.				
Biggenden ..	1·76	41	0·41	1·32
Bundaberg ..	2·61	57	0·73	0·84
Brisbane	2·80	88	0·71	1·35
Caboolture ..	2·98	53	1·37	2·30
Childers	2·14	45	0·19	0·91
Crohamhurst ..	5·06	47	2·21	4·31
Esk	2·03	53	1·32	0·93

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1940.	May, 1939.
South Coast—contd.	In.		In.	In.
Gatton College ..	1·58	41	0·86	0·71
Gayndah	1·56	69	0·61	0·28
Gympie	2·82	70	1·20	1·35
Kilkivan	1·84	61	1·35	1·57
Maryborough ..	2·99	69	1·32	2·15
Nambour	5·10	44	3·18	4·77
Nanango	1·52	58	1·78	0·49
Rockhampton ..	1·60	69	0·31	1·41
Woodford ..	3·02	53	0·90	2·61
Central Highlands.				
Clermont ..	1·29	69	0·27	0·37
Gindie	0·91	41	..	0·09
Springsure ..	1·23	71	0·58	0·82
Darling Downs.				
Dalby	1·27	70	2·80	0·01
Emu Vale ..	1·13	44	0·76	0·12
Hermitage ..	1·18	33	..	..
Jimbour	1·16	52	3·79	0·20
Miles	1·51	55	0·72	1·09
Stanthorpe ..	1·78	67	0·55	0·55
Toowoomba ..	2·17	68	1·74	1·38
Warwick	1·49	75	0·97	0·08
Maranoa.				
Bungeworgorai ..	0·95	26	..	0·20
Roma	1·43	66	0·65	0·49

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1940.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·95	81	71	84	12	65	22	99	10
Herberton	..	72	56	79	13, 15	36	23	235	11
Rockhampton	30·10	79	58	86	1	49	23	31	7
Brisbane	30·16	73	55	82	1	49	19	71	6
Darling Downs.									
Dalby	30·18	72	45	79	5	34	19	280	6
Stanthorpe	..	65	38	71	17	25	19, 26	55	3
Toowoomba	..	66	48	72	17	43	19	174	5
Mid-Interior.									
Georgetown	29·99	87	57	91	1, 3, 4, 15	45	22	1	1
Longreach	30·10	80	49	86	4	41	22	3	1
Mitchell	30·16	72	43	78	17	30	27	90	3
Western.									
Burketown	30·02	85	60	91	17	49	22	5	2
Boulia	30·11	78	50	84	7, 8, 28, 29	44	14, 22, 23	10	1
Thargomindah ..	30·14	73	50	84	16	37	27	12	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1940.		August, 1940.		MOONRISE. July, 1940.	MOONRISE. Aug., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·44	5·8	6·33	5·24	2·23	3·48
2	6·44	5·9	6·33	5·25	3·17	4·41
3	6·44	5·9	6·33	5·25	4·12	5·33
4	6·44	5·9	6·32	5·25	5·7	6·22
5	6·44	5·10	6·31	5·25	6·2	7·9
6	6·43	5·10	6·30	5·26	6·54	7·54
7	6·43	5·10	6·30	5·26	7·43	8·38
8	6·43	5·11	6·29	5·26	8·31	9 21
9	6·43	5·12	6·28	5 26	9·14	10·5
10	6·42	5·12	6.27	5·27	9·54	10·50
11	6·42	5·12	6·27	5·28	10·39	11·37
						p.m.
12	6·42	5·13	6·26	5·29	11·22	12 27
					p.m.	
13	6·41	5·13	6·24	5·29	12·5	1·19
14	6·41	5·14	6·23	5·30	12·51	2·13
15	6·41	5·14	6·23	5·30	1·39	3·8
16	6·41	5·15	6·22	5·31	2·30	4·2
17	6·40	5·15	6·21	5·32	3·23	4·56
18	6·40	5·15	6.20	5 32	4·18	5·49
19	6·40	5·16	6·19	5·32	5·14	6·41
20	6·40	5·17	6·18	5·33	6·9	7·33
21	6·39	5·18	6·17	5·33	7·3	8·23
22	6·38	5·18	6·17	5·34	7·56	9·14
23	6·38	5·19	6·16	5·34	8·48	10·5
24	6·38	5·19	6·15	5·34	9·39	10·57
25	6·38	5·20	6·14	5·34	10·30	11·49
26	6·37	5·20	6·13	5·35	11·22	..
27	6·37	5·20	6·12	5·36	..	12·42
					a.m.	a.m.
28	6·36	5·21	6·11	5·37	12·14	1·35
29	6·36	5·22	6·10	5·37	1·6	2·28
30	6·35	5·22	6·8	5·37	2.0	3·19
31	6·34	5·23	6·7	5·38	2·54	4·9

Phases of the Moon, Occultations, &c.

5th July.	●	New Moon	9 28 p.m.
12th ,,	☽	First Quarter	4 35 p.m.
19th ,,	○	Full Moon	7 55 p.m.
27th ,,	☾	Last Quarter	9 29 p.m.

Perigee, 10th July, at 5.0 a.m.
Apogee, 25th July, at 3.0 p.m.

Toward the end of May Venus (the Evening Star) shone with exceeding lustre. Now the brilliant planet is getting rather too far into the bright twilight to be well seen, but it is interesting in a telescope as it appears as a beautiful crescent. Our sister world is passing in between us and the sun; therefore, the sun shines chiefly on the other side, leaving only a slender crescent sun-lit visible from planet earth. This crescent will grow more slender until Venus is lost in the sunset glow. On 26th June Venus will pass nearly between the earth and the sun. We shall then be at our nearest to the earth's twin sister planet, which will be only about 27,000,000 miles away. Were we native to that brilliant world "We should see the globe we groan in, fairest of the evening stars." From Venus the earth would appear a splendid object, very much larger than Venus ever appears to us, as the whole earth would be illumined by the sun, whereas, when Venus is at its nearest to us, she is quite invisible as the night side only is presented this way. After Venus has passed the sun, she will, of course, soon appear on the other side, and we shall have Venus as the Morning Star, rapidly becoming very brilliant.

Jupiter is the bright "star" rising a little before dawn and may be seen near the dying moon on 3rd June.

Midwinter will occur when the sun reaches his farthest north during the first hour of 22nd June. After that date, very gradually at first, he will begin to move southward to bring us the summer.

The sun is a little out of the centre of the almost circular path the earth makes around him. Therefore, at one time of the year we are farther from him than at any other. On 4th July this will occur and then we shall be 94,500,000 miles from the great power station from whence the earth draws all her energy. This great distance, which is more than a million and a-half miles greater than the average, does not cause the cold of winter, for in the northern hemisphere it is mid-summer.

4th Aug.	●	New Moon	6 9 a.m.
10th ,,	☽	First Quarter	10 0 p.m.
18th ,,	○	Full Moon	9 2 a.m.
25th ,,	☾	Last Quarter	1 33 p.m.

Perigee, 6th August, at 1.0 p.m.
Apogee, 22nd August, at 8.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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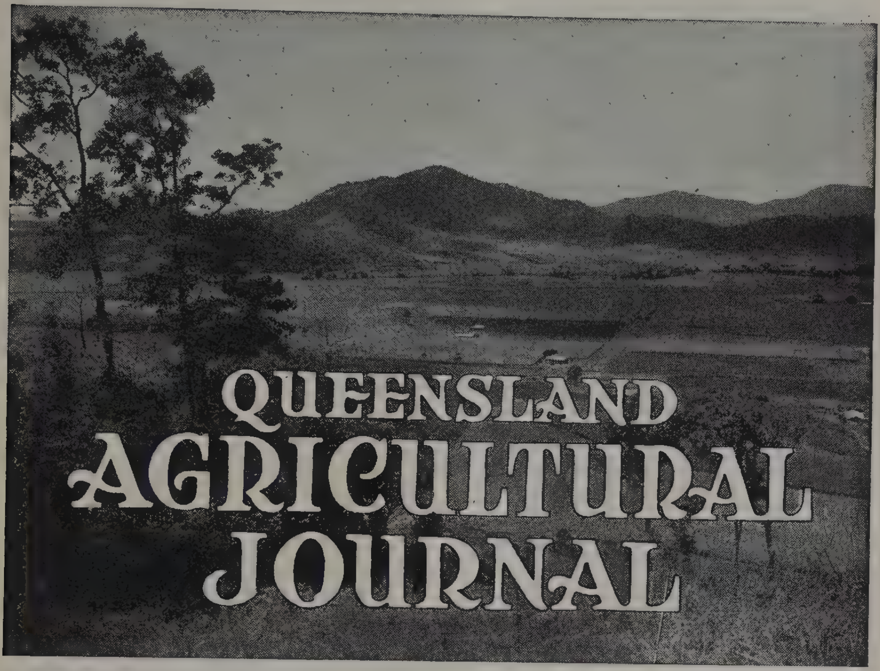

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

National Cotton Needs.

IN the course of a recent statement to the Press, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that a very substantial increase in the production of Queensland cotton was required during the coming season.

The Minister pointed out that Australian consumption of raw cotton had increased so rapidly during the last two years that Queensland's production of cotton had been greatly exceeded. It had not only been an economic loss to this State that sufficient cotton had not been produced, but a serious drain on sterling exchange was now occurring through the necessity of having to purchase considerable quantities of cotton from non-sterling countries.

Mr. Bulcock stressed the fact that Queensland could grow cotton with most of the qualities of imported cotton, and it was therefore of national importance that all farmers who had suitable land should plant as large an acreage as they could properly cultivate. He added that the Queensland Government was seized with the necessity of increasing cotton production in this State and had embarked on a programme which aimed at stimulating the growing of cotton under conditions of supplementary irrigation facilities and the improvement of the average acreage yield.

As part of the programme covering cotton growing under irrigation, an officer trained in soil investigation in the irrigated areas of the southern States of Australia had been seconded from the Soils Division of the Council for Scientific and Industrial Research, to inquire into the suitability of the soils in areas proposed for growing cotton under irrigation in Queensland.

It was believed, Mr. Bulcock continued, that an appreciable acreage of cotton could be grown under irrigation by the use of individual pumping plants established on farms where ample supplies of either surface or underground waters are available. The Queensland Cotton Board had financed the installation of a few irrigation plants of this type during the last two seasons and encouraging results had been obtained.

The Government proposed, therefore, to investigate fully the merits of this system of cotton growing, and the Department of Irrigation and Water Supply had therefore developed a supply of underground water at the Biloela Research Station, in the Callide Valley, where a comprehensive programme of investigational work would be conducted by an officer especially appointed for this purpose.

The possibility of developing further supplies of underground water in the Callide Valley was now being explored by the Department of Irrigation, Water Supply and Sewerage, with the object of establishing demonstrational areas of cotton grown with supplementary irrigation under the supervision of officers of the Department of Agriculture and Stock. Complementary to these demonstrations, a series of experiments and demonstrations in the irrigation of cotton with surface water—such as streams or large lagoons—and in the northern districts, where water is easily obtainable at shallow depths in the alluvial deltas of rivers, had been planned.

Such a comprehensive programme, Mr. Bulcock thought, would provide sufficient data within a few seasons to determine the most efficient and economical method of growing cotton under irrigation. With such information available, the Government could then proceed with the development of the most practicable facilities for the extensive growing of cotton under irrigation.

Referring to the possibilities of growing cotton successfully without irrigation, Mr. Bulcock stated that the results which had been obtained by his Department from investigations related to growing cotton under rainfall conditions only, if practised in all of the areas of rain-grown cotton, would markedly increase the average acreage yield of cotton in this State. An increase in the extension activities of the department had therefore been planned. Obviously it would be impracticable to come in personal contact with all farmers who might be interested in growing cotton and it was stressed that farmers desiring detailed information should get in touch with the nearest agricultural officer. Qualified officers to advise on cotton growing are located—care of the Department of Agriculture and Stock—at Ayr, Mackay, Rockhampton, Biloela, Bundaberg, Monto, Gayndah, Kingaroy, Brisbane, and Bungeworgorai State Reserve, near Roma.

Mr. Bulcock mentioned that one of the outstanding results which had been obtained in the investigations by his Department had been the demonstration of the benefits to be derived from a cotton-grass land rotational practice. Over a series of years and under a wide range of seasonal conditions, it had been demonstrated that cotton crops grown on cultivations in the first, second and possibly third year after the ploughing of old established grassland could usually be relied on to outyield crops grown on old cultivations of similar types of soil. In many instances, gains amounting to as much as 50 and even 100 per cent. had been realised.

Farmers intending to grow cotton, added the Minister, were, therefore, urged to plough up grassland for cotton cultivation if at all practicable. Farmers who engaged in dairying in the coastal areas around Rockhampton, in the Wowan district, Callide Valley, Upper, Central, South, and coastal sections of the Burnett, Brisbane Valley, the Fassifern, Lockyer, and along the southern slopes of the Main Dividing Range north and west of Toowoomba, should, he said, give careful consideration to this aspect of cotton growing. In all of these districts there were many farms on soils highly suitable for cotton production, which had an old pasture that was contributing little feed for the dairy herd and contained weed growth which often caused milk taint. By ploughing these old eaten-out pastures and planting them to cotton and sowing fresh pastures on some of the old cultivations, the farmer would not only aid in the national effort by growing cotton, but would improve the quantity and quality of his cream through grazing his herd on the newer pastures.

The Minister added that the Commonwealth Government had announced the new schedule of bounty payments for a period of five years as from 1st December, 1940. This provided the opportunity for Queensland to develop cotton growing on a scale that would be commensurate with the Australian requirements for raw cotton. It was particularly necessary, he emphasised, that under war conditions this be done, and farmers in the established cotton-growing districts should therefore make every effort to produce cotton on an efficient basis. By so doing, the value of cotton in the cropping rotations would be so thoroughly demonstrated that the cotton growing industry would be permanently established as a profitable rural enterprise.

Food for Britain.

THERE is every comfort in the reflection these days that every precaution is being taken to ensure the command of the seas. So far as the feeding of the people is concerned, the lessons of the last war are being applied skilfully and effectively. The Navy sees that the sea routes to Britain are kept open, a wise rationing policy is preventing waste—and these two factors are averting high living costs. In the meantime, foodstuffs are flowing into the British Isles with almost uninterrupted regularity. Protected by the might of the Navy, Australia and the other Dominnons can, if necessary, keep British pantries full of essential commodities. After all, it is the food supply of a nation that is a vital factor in war time, and the food supply of Britain is in safe keeping.

The Pineapple Soils of the Nambour, Woombye and Palmwoods Districts.

L. G. VALLANCE, M.Sc., Assistant Research Officer, and H. L. WOOD, B.Sc., Assistant to Research Officer.

CONTENTS.

I. GENERAL DESCRIPTION OF THE AREA—
    Location and area.
    Topography.
    Geology.
    Vegetation.
    Climatic data.

II. DESCRIPTION AND CLASSIFICATION OF THE SOILS—
    Woombye Series—
        Woombye sandy loam.
        Woombye loam.
    Palmwoods Series—
        Palmwoods sand.
        Palmwoods sandy loam.
    Coe's Creek Series—
        Coe's Creek sand.
        Coe's Creek sandy loam.
    Nambour sand.
    Rosemount sand.
    Rosemount clay loam.

III. PHYSICAL ANALYSES: MOISTURE RELATIONSHIPS—
    Mechanical analyses.
    Structural characteristics: Consistence.
    Profile development in relation to aeration.
    Moisture equivalents.
    Wilting coefficient.
    Soil Moisture.

IV. CHEMICAL ANALYSES—
    Organic carbon, nitrogen, and C : N ratio.
    Replaceable bases.
    Phosphoric acid.
    Hydrochloric acid analyses.
    Reaction; buffer capacity; sulphur requirement—
        Reaction.
        Buffer capacity.
        Sulphur requirement.

V. PEDOGENESIS.

VI. SUMMARY.

APPENDIX.

I.—GENERAL DESCRIPTION OF THE AREA.

Location and Area.

THE area surveyed consists of approximately 2,200 acres in the Nambour, Woombye, and Palmwoods districts. These districts are located in the parishes of Maroochy and Mooloolah, county of Canning, south-eastern Queensland. The town of Nambour, which is the main centre, is situated on the North Coast Railway, 65 miles north of Brisbane. The smaller townships of Woombye and Palmwoods are respectively 3 miles and 5 miles south of Nambour, and both are also on the railway. Many portions of the area are within 10 miles of the coastline, and the heights of the railway stations at Nambour, Woombye, and Palmwoods above sea-level are 52, 68, and 92 feet. The reference point for the parish—Lat 26° 40′ S., Long. 153° 00′ E.—is some 2 miles east of Woombye.

Topography.

The country is drained in the north by Petrie Creek, and in the west by Coe's Creek, which is itself a tributary of Petrie Creek. Woombye and the surrounding district is drained by Paynter Creek. This watercourse extends south to Palmwoods on the western side of the railway line and more or less parallel to it. The country is hilly, particularly in the Coe's Creek and Rosemount districts, which form the western and eastern flanks. South of Woombye the area which extends towards Palmwoods is characterised by the more gentle topography associated with the dark brown–red-brown soils.

In general, the dominating topographical features are the frequent ridges. These rise some 200 to 300 feet above sea-level and are 1 to 2 miles in length. They may be somewhat abrupt, but are usually long ridge slopes admirably suited for cultivation.

Geology.

Although it is flanked on the west by the basaltic uplands of the Blackall Range, igneous rocks of material importance do not occur in the area surveyed. Some minor intrusions were observed between Nambour and Rosemount.

The country rock of the area is a Mesozoic sedimentary series. This underlies both the dark brown–red-brown and the grey-brown soil groups. Coarse sandstones are of frequent occurrence, but there is a rather wide variation lithologically. Sometimes the structure is loose and incoherent, but quite often there is a considerable degree of compaction and cementation. These harder phases are usually ferruginous. Throughout the whole series, the joint planes and cracks are infilled with material rich in iron and silica which is much more resistant to weathering than the original rock. Soft greyish-white shales occur in close association with the sandstones. These usually contain plant remains similar to those of the shales of the Triassic Ipswich Coal Measures. Fossil wood is extremely abundant, and large trunks several feet in length occur throughout the district.

The soil formations are mainly secondary in relation to the sedimentary rock. The red-yellow-white mottled decomposition zone which directly underlies the soil proper must be regarded as the C or parent material. This feature is common to the major soil groups. The deepest observed depth of the mottled zone is 30 feet. In those cases where the sandstone is light-coloured and of a loose, incoherent nature, the mottled zone may be replaced by a BC horizon.

Vegetation.

An occasional development of tropical rain-forest occurs throughout the surveyed areas, particularly on the heavier soils of the Woombye series. Since these areas were amongst those first cleared for cultivation, however, the extent to which they originally occurred is unknown. The vegetation association of the greater part of the area is that of eucalypt forest. The most common eucalypts and macrovegetation are:—Tallowwood (*E. microcorys*), Yellow Stringybark (*E. acmenioides*), Blackbutt (*E. pilularis*), Red Stringybark (*E. resinifera*), Grey Gum

(*E. propinqua*), Spotted Gum (*E. maculata*), Red Bloodwood (*E. corymbosa*), White Bloodwood (*E. trachyphloia*), Turpentine (*Syncarpia laurifolia*), Paperbark (*Melaleuca leucadendron*), and the common bracken (*Pteris aquilina*).

Climatic Data.

Rainfall figures for the townships of Nambour and Palmwoods are given in Table 1. The nearest centre for which both temperature and relative humidity data are available is at Gympie, which is some 41 miles north of Nambour. Temperatures have also been recorded at Beerwah, 13 miles south of the area, and these are almost identical with those at Gympie. Temperature data for the latter station are given in Table 2.

TABLE 1.

RAINFALL DATA FOR NAMBOUR AND PALMWOODS.*

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Nambour—													
Rainfall in Inches	9·62	9·74	8·99	6·32	4·68	3·75	2·69	1·85	2·53	3·07	4·02	6·80	64·06
Number of Wet Days	12	13	15	9	10	7	6	7	8	7	6	8	108
Palmwoods—													
Rainfall in Inches	10·01	10·90	8·71	6·70	4·39	3·78	2·41	1·93	2·40	3·01	4·12	7·14	65·50
Number of Wet Days	8	10	18	10	11	6	5	6	6	8	9	6	103

* Averages for 41 and 42 years respectively.

TABLE 2.

TEMPERATURE DATA FOR GYMPIE.*

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean Maximum	87·6	86·4	84·7	81·7	76·4	71·4	71·4	73·9	78·8	83·5	87·0	88·4	80·9
Mean Minimum	66·5	66·4	63·4	57·7	49·8	46·3	42·2	44·4	50·2	56·2	61·4	64·9	55·8
Rel. Humidity at 9 a.m.	74	76	77	77	77	78	75	73	68	65	65	68	73

* Temperature Averages for 24 years; Humidity Averages for 22 years.

Prescott (5) has shown that the formula "e = 260 s.d." expresses the relation between the saturation deficit "s.d." and evaporation "e" at a number of Australian stations.

The mean monthly evaporation calculated in this way from the mean monthly saturation deficit is compared with the mean monthly rainfall in Plate 6. It will be seen that the rainfall is greater than the evaporation for the major portion of the year—namely, from late November to July. During this period leaching is effective, and this is reflected in the low base status and high degree of unsaturation of the soils of the area.

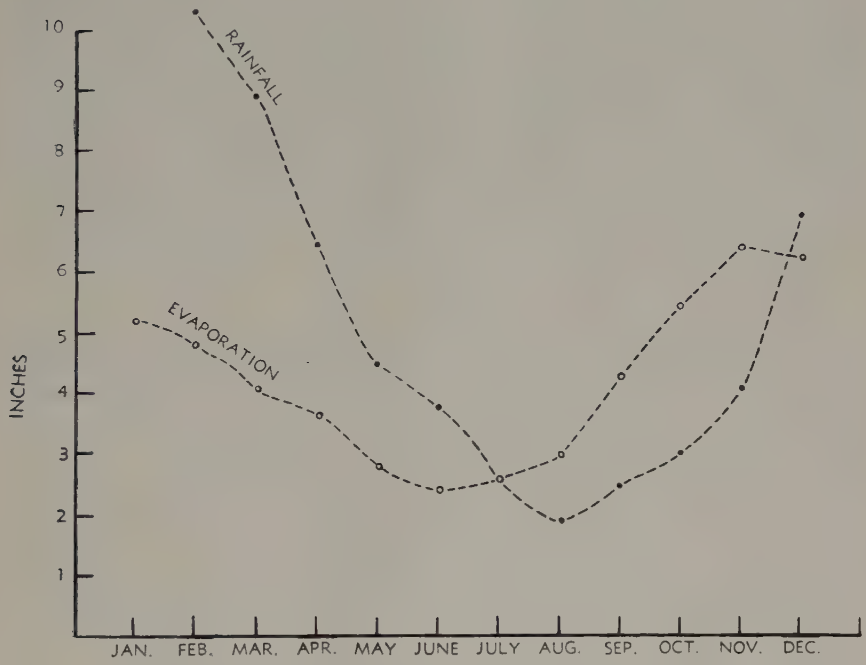

Plate 6.

Showing mean monthly rainfall and mean monthly evaporation in inches. The evaporation is calculated from the equation—

$$e = 260 \text{ s.d.}$$

The mean monthly rainfall during the spring months is less than the mean monthly evaporation. During this season the moisture-supplying power of the various soil types is of considerable significance.

The evaporation falls rapidly with the approach of the colder months and reaches a minimum in June. Autumn rainfall is considerable, though markedly less than in the summer. Consequently, soil phases characterised by an impeded water movement and a deficient aeration will have these tendencies accentuated during the winter months. Because of the xerophytic and epiphytic relationships of the pineapple plant (4), therefore, conditions such as these will result in serious injury to the roots of this crop during seasons of heavy winter rainfall.

The precipitation per wet day is 0·59 inch at Nambour and 0·64 inch at Palmwoods. This high intensity must considerably reduce the effectiveness of the rainfall to a figure much less than is implied by an annual precipitation of 64 or 65 inches.

II.—DESCRIPTION AND CLASSIFICATION OF THE SOILS.

The soils of the area fall naturally into two groups. These are:—

(1) The dark brown–red-brown soils, with reddish subsoils.

(2) The shallower soils with a grey-brown surface presenting a well-leached appearance and a characteristic yellow-brown subsoil.

The colour differences of these two groups form a noticeable feature of the soils, and since the colour change is accompanied by fundamental differences in texture, depth, and moisture relationships, it forms a convenient index by means of which to differentiate these two major groups. In the field, an abrupt transition from one group to the other does not usually occur. The boundaries are not well defined and, furthermore, they take the form of a general transitional zone rather than a complex of the two groups. A feature common to both is the presence of a decomposition horizon occupying a position between the solum and the country rock. This must be regarded as a C horizon, and the uniformity of its presence throughout the area suggests a genetic relationship between the two groups.

The group which has been described as the dark brown–red-brown soils has been classified as the Woombye Series and comprises two soil types—the Woombye loam and Woombye sandy loam. The soils falling within the grey-brown group are represented by the Palmwoods Series, Coe's Creek Series, Nambour sand, and the Rosemount sand. These occur generally on the steep hillsides of the area and are of a more sandy nature than the Woombye Series. The shallow sandy material, which usually overlies an impervious clay subsoil, is markedly susceptible to erosion. At the bottom of the slopes it may be deepened by the accumulation of silted material, while exposed pavements of the parent sandstone frequently occur towards the top of the slope. The prevalence of serious erosion renders the definition of the normal profile very difficult. Under these circumstances it is impracticable to attempt any systematic mapping of the soil type boundaries. On many slopes, due to the gradual building-up towards the bottom, the normal profile is best regarded as a more or less uniform catena, and this concept is quite a useful one when applied to all the soils of the area. It should be noted that, from an agricultural viewpoint, the variation within any of these soil types due to erosion is often greater than the variation between the types themselves.

The Rosemount clay loam is not included in the two major soil groups. It is an immature soil and its parent material is a coarsely laminated shale, which is not typical of the country rock of the area. The distribution of this soil with regard to the present pineapple-producing land is not very extensive. However, strict attention to its particular requirements of soil management will allow the successful production of pineapples on this soil type. For this reason it has been included in the survey.

Woombye Series.

The Woombye Series, with its characteristic red-brown colour, is a feature of the Nambour-Woombye-Palmwoods area. The major development is on the long, gentle, and unbroken ridges near the township of Woombye, and extending generally southwards to Palmwoods. It is developed on a sedimentary series of sandstone. This primary material is mainly obscured by a thick, mottled decomposition zone, which has been observed in places to a depth of 30 feet. The series falls naturally into two types—Woombye sandy loam and Woombye loam. They are differentiated by the textural properties of their surface soils and subsoils. The influence of these properties on their moisture relationships is discussed subsequently.

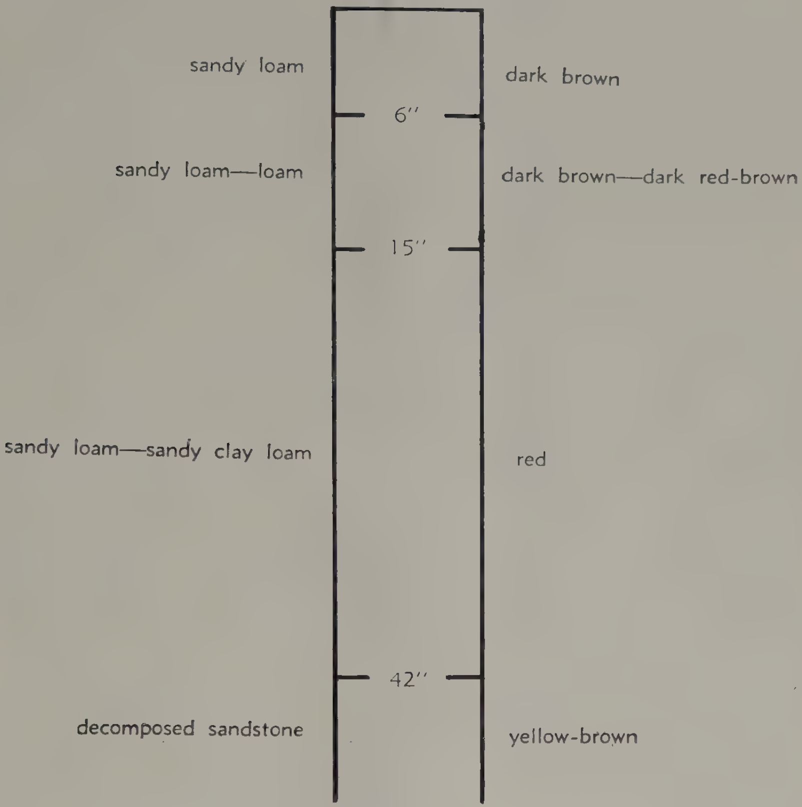

Plate 7.
Woombye Sandy Loam.

Woombye sandy loam.—A typical profile of this soil is diagrammatically represented in Plate 7. The surface is a dark brown sandy loam. This A_1 horizon grades uniformly into the A_2, which is slightly heavier in texture, and in which the red-brown colour becomes predominant as the organic matter decreases. Normally there is no A_0 horizon. In the normal profile the A horizon varies from 12 to 15 inches deep. The structure is not well defined but is usually in the form of soft, irregular aggregates. These break easily. They are friable and contribute to the porosity of the soil.

In the type profile the illuvial horizon begins at a depth of 15 inches. In common with the majority of the coastal soils of southern Queensland, there is no abrupt line of demarcation between the eluvial and illuvial horizons. The texture of the B horizon is sandy loam to sandy clay loam. The coarse sand is still predominant in the sand fraction. Due to the low percentage of fine sand and silt, the increased clay content imparts a sandy clay loam texture rather than a loam. However, the drainage is not impeded and, usually, the subsoil is friable and open. The structure is similar to that of the A horizon, except that the irregular aggregates are firmer and somewhat larger. Root penetration through soil and subsoil is quite good.

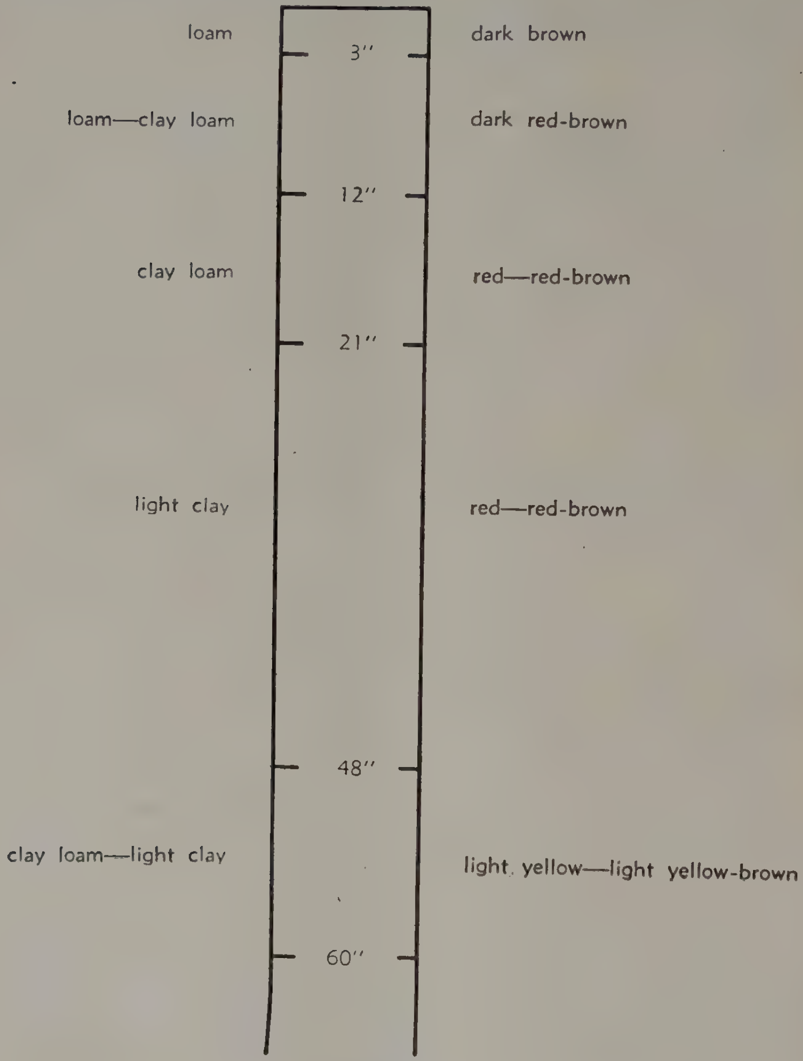
loam
3″
dark brown
loam—clay loam
dark red-brown
12″
clay loam
red—red-brown
21″
light clay
red—red-brown
48″
clay loam—light clay
light yellow—light yellow-brown
60″

Plate 8.
WOOMBYE LOAM.

The C horizon is a mottled zone, mainly yellow-brown in colour, and consists of decomposed sandstone. This is sticky when wet. It is impermeable. The inorganic colloid separated from this horizon is yellow in colour and contrasts sharply with the bright red of the colloid of the A and B horizons. This higher degree of hydration of the iron oxides may be taken as an index of wet and anaerobic conditions. However, since this zone occurs at a depth of 3½ feet to 4 feet under normal conditions, it has little or no ill effect on the rooting system of the pineapple plant.

Stoniness is usually confined to the topmost portion of the A horizon. Quite frequently the surface is characterised by irregular-shaped pieces of "ironstone." These are more or less flat and are of an accretionary nature, consisting of sand grains cemented to a hard coherent mass by material which is mainly ferruginous. Normally, these are neither sufficient in number nor large enough in size to present any serious obstacle to cultivation.

Woombye loam.—This soil type occurs in close association with the Woombye sandy loam. Its topographical features are similar, and, although in some cases it may occupy a steep slope, it is generally characterised by gentle ridges and plateaux of limited area. It is distinguished from the sandy loam chiefly by its texture, which is consistently heavier throughout the profile until the C horizon is encountered. This may readily be seen by contrasting Plates 7 and 8.

The surface horizon in the type profile is a dark brown loam. A well-developed crumb structure is generally present. The profile becomes progressively heavier with depth, and at 12 inches the subsoil has the texture of a clay loam. The colour here is red to red-brown, and the bright colour of the inorganic colloid is not masked by organic matter. Reference to the Appendix shows that there is a marked decrease in the organic matter in the lower horizons; actually, the organic carbon below 3 inches deep is less than one-half of that in the surface (A_1) horizon.

At a depth of about 20 inches the texture becomes moderately heavy, and is best described as light clay. It is compact, and thus water movement is impeded. This is in direct contrast to the B horizon of the Woombye sandy loam, which is friable and open. Under normal conditions, as exemplified by the type profile. it provides a favourable environment for the root development of the pineapple plant.

Quite frequently, erosion has removed portion of the A horizon of the Woombye loam, so that this heavy material may occur within 12 inches of the surface. Under those circumstances, and in view of the prevailing climate, such soil conditions are definitely unfavourable for pineapple culture.

Palmwoods Series.

Towards the south of the area under review a group of soils occurs in close association with the Woombye soils which have been termed the Palmwoods Series. This series may be divided into two types—the Palmwoods sand and Palmwoods sandy loam. From the point of view of topography, parent material, and vegetation association, they possess many similarities with the Woombye soils. It would appear that the profile characteristics of the Palmwoods Series occupy an intermediate position between the two major groups, which have been described as the dark brown–red-brown soils, and the grey-brown soils with yellowish-brown subsoils. While some of the red colour of the Woombye Series is in evidence, a yellowish tinge is predominant, and the soils have a more highly leached appearance. Reference to the Appendix indicates a much lower content of Fe_2O_3 and a corresponding decrease of total sesquioxide (R_2O_3). Similarly, the texture of the surface soil becomes more sandy in the Palmwoods sand.

Palmwoods sand.—The surface soil of this type is a dark brown–yellow-brown sand. It is somewhat darkened by organic matter which decreases sharply in the A_2 horizon. In common with the other soils of the area, there is no A_0 horizon. In the A_2 the clay increases slightly, and the texture is a sandy loam to sandy clay loam. In the type profile (Plate 9), the B horizon commences at a depth of 12 inches, and this sandy clay loam subsoil continues to a depth of 3 feet. The colour of the profile is characteristically yellow-brown to red-brown, with the exception of the surface horizon, which is coloured by organic matter.

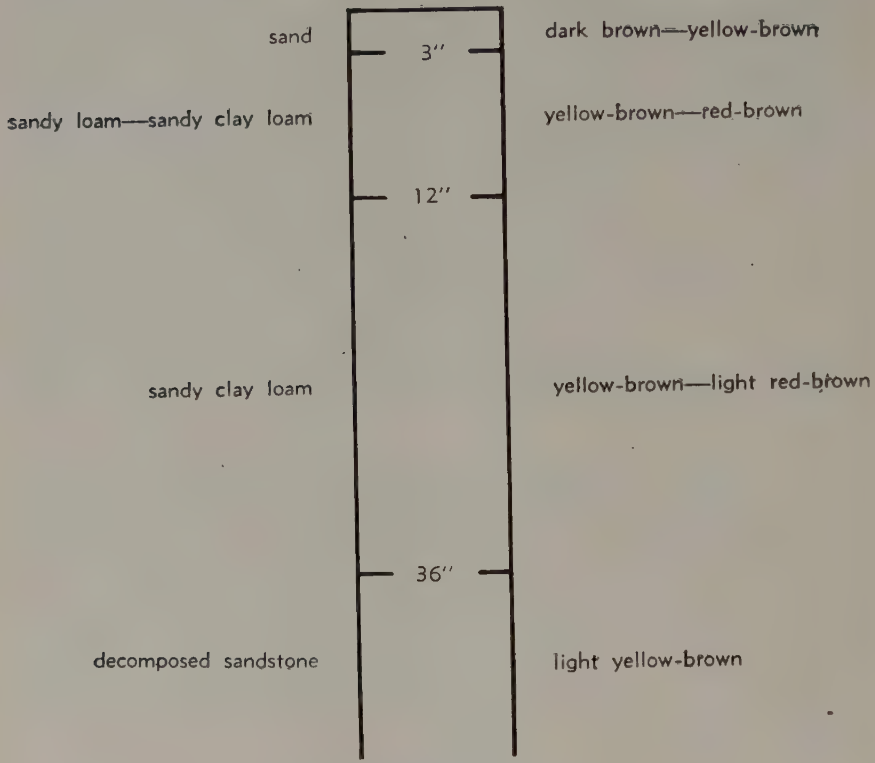
sand
dark brown—yellow-brown
3″
sandy loam—sandy clay loam
yellow-brown—red-brown
12″
sandy clay loam
yellow-brown—light red-brown
36″
decomposed sandstone
light yellow-brown

Plate 9.
PALMWOODS SAND.

The structure is of the single-grained type in the surface horizon, but becomes slightly cloddy with depth. In general, the structure is not well defined. On moderate slopes the drainage of the soil is good. It is, however, badly eroded in many cultivated areas, and in some cases the sticky sandy clay loam subsoil has been observed less than 4 inches from the surface. In such eroded areas the question of soil management is an important one, since the subsoil is at a shallow depth, even in the normal profile. On the lower levels, such as at the foot of a slope, this soil should not be planted to pineapples because the subsoil, which is never very permeable to water, may become saturated under these conditions.

Palmwoods sandy loam.—Texturally, this soil has many features in common with the Woombye sandy loam. In the field, however, it is readily distinguished by the dominant yellow tinge, and its departure from the red colour of the Woombye Series. That this colour is a reflection of other fundamental variations is seen from the Appendix. The percentage of sesquioxides (soluble in 20 per cent. hydrochloric acid) is much lower than that of the Woombye soils.

The profile of the Palmwoods sandy loam is somewhat heavier than that of the Palmwoods sand. This is particularly the case with regard to the subsoil, which, in the type profile, shows an increase in clay content of approximately 11 per cent. The surface soil generally tends to the sandy loam range rather than sand, as in the former type. Mechanical analyses of the profiles of these two soils given in the Appendix are typical.

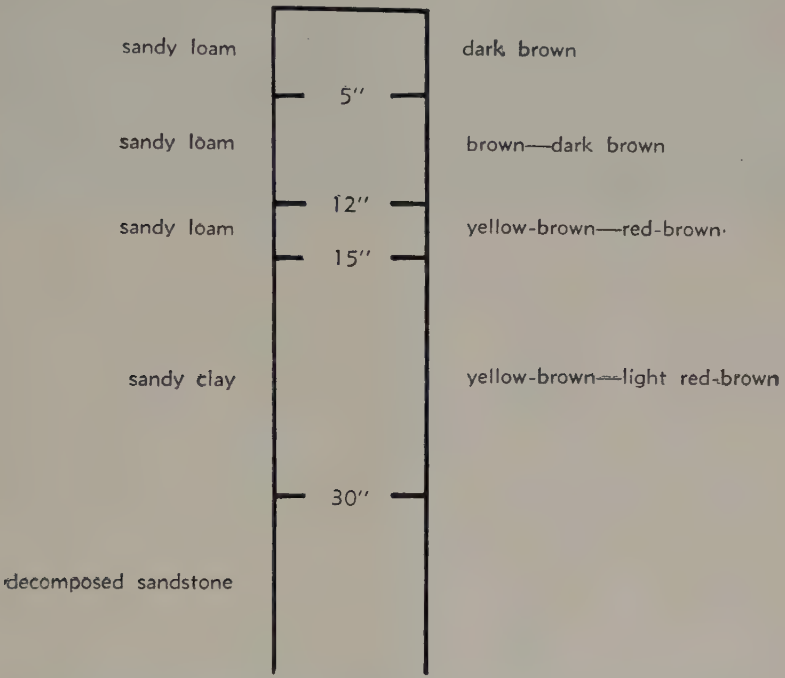

Plate 10.
Palmwoods Sandy Loam.

The type profile is represented by Plate 10. A sandy loam texture occurs to a depth of 15 inches. This material is quite open and friable, and normally well drained. There is no well-defined structure. A marked increase in the clay content occurs in the subsoil, and as this is compact and retentive of moisture, it considerably impedes drainage. The presence of this rather unfavourable subsoil considerably reduces the agricultural value of the Palmwoods sandy loam. The importance of correct field management with regard to drainage and layout of the plantation cannot be too strongly stressed. For this reason, the Palmwoods sand is often to be preferred to the Palmwoods sandy loam for pineapple culture.

Coe's Creek Series.

This series of sandy soils is typical of the grey-brown group of soils with yellow-brown subsoils. The profile has a podsolised appearance which is characteristic of many soils of coastal southern Queensland. The movement of iron and alumina is shown in the Appendix. The sesquioxide content is much lower than that of the Woombye and Palmwoods Series. The red colour which characterises the Woombye soils is not present in the Coe's Creek Series because of the lower content of iron.

In this series, two distinct soil types may readily be recognised. These are the Coe's Creek sand and the Coe's Creek sandy loam. They occur in close association under the same topographical and vegetative control. The terrain is hilly, and slopes of one in five are quite common. As would be expected on such slopes as these, much havoc has been done by soil erosion.

It is difficult to define the normal profile of the Coe's Creek Series, since there is a gradual building-up of washed material towards the bottom of the slopes. Because of this building-up, it is also difficult to define the boundaries of the two soil types of this series. However, these soils form a definite group of considerable agricultural importance. They are attended by characteristic soil moisture relationships and fertilizer requirements, which are all-important from the point of view of pineapple culture.

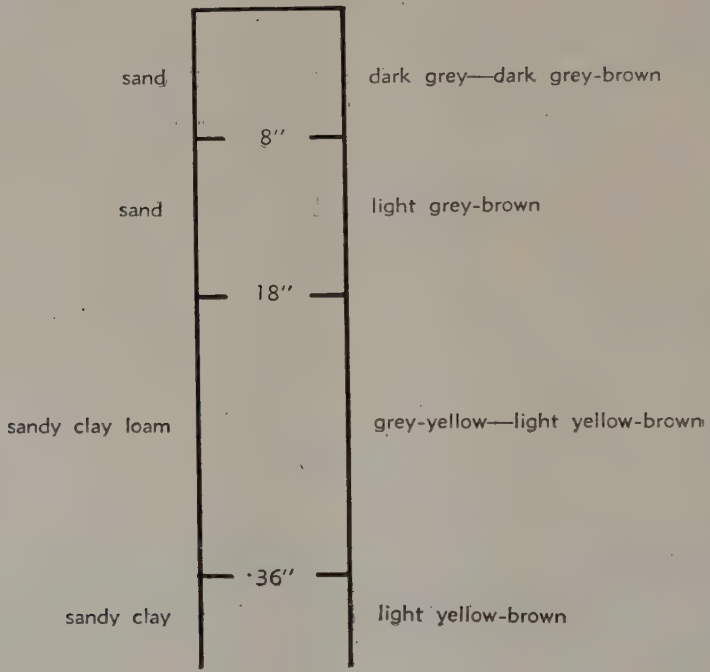

Plate 11.
COE'S CREEK SAND.

Coe's Creek sand.—The type profile of the Coe's Creek sand is diagrammatically shown in Plate 11. The profile has a sand content of approximately 85 per cent. to a depth of 18 inches. The very sandy nature of this material is further emphasised by the wide "coarse sand-fine sand" ratio. The colour is grey-brown, becoming lighter with depth as the organic matter decreases. The A_1 horizon is dark grey to dark grey-brown.

The clay fraction increases in the B horizon, but the sand content is still considerable, with the coarse fraction predominant. Underlying this horizon at a depth of 39 inches is the C horizon. The clay content of this markedly impermeable horizon, which is a decomposition zone, is normally high; throughout it hard pieces of undecomposed sandstone occur as "floaters." The surface soil has a single-grain structure and is therefore loose and open. The subsoil, which becomes increasingly compact with depth, is normally moist and plastic. When brought to the surface it dries hard and cloddy.

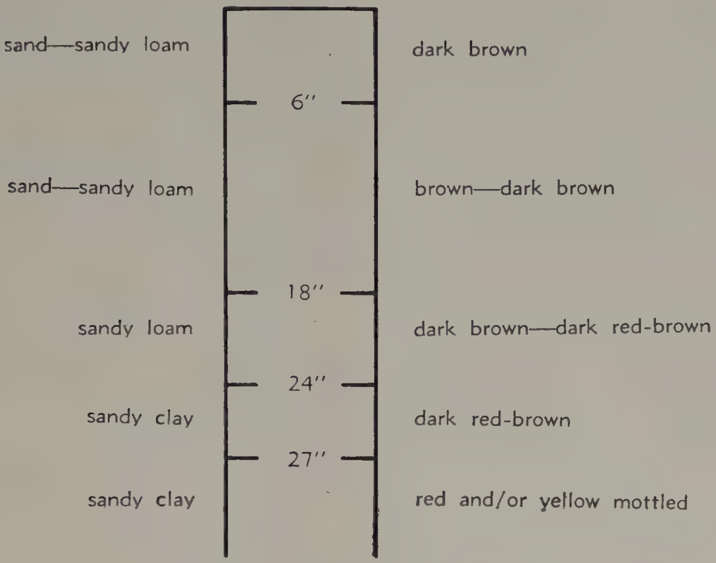

Plate 12.
Coe's Creek Sandy Loam.

Frequently the surface soil is characterised by a considerable degree of stoniness. Large waterworn quartz pebbles occur intermingled with sandstone fragments. In some cases a band of river gravel is met with at depths varying between 2 and 3 feet. In very few instances, however, is the concentration of stony material sufficient to hinder cultivation to any extent.

The value of this soil for pineapple-growing is determined by the amount of erosion which it has undergone. Even in its most favourable condition it is severely affected by droughty periods, since its moisture-retaining capacity is low.

Coe's Creek sandy loam.—This soil type is closely associated with the Coe's Creek sand. Its topographical features are similar, as also is its degree of stoniness. The texture of the profile is slightly heavier and the colour is darker. The surface soil usually contains about 10 per cent. of clay. It is best described as a sandy loam, although it is never far removed from a sand. Its colour is dark brown, and its organic content is normally greater than that of Coe's Creek sand. A single-grain structure is evident. The A horizon remains loose and open under cultivation.

In the type profile (Plate 12) the subsoil horizon becomes heavier, since the clay increases to 25 per cent. The colour is dark brown. Reference to the Appendix shows that the sesquioxide content is considerably higher than that of the Coe's Creek sand. This is reflected in the colour differences of the two profiles.

Since this soil may occupy steep slopes, denuded phases are common. In many cultivated areas the loss of the major portion of the A horizon presents a serious problem to the pineapple-grower.

Normally, the moisture reserve of this soil is quite good. Its natural drainage is also satisfactory. Since the subsoil is but slowly permeable, however, unfavourable topographical conditions create the need for controlled drainage and proper layout of crop rows. The soil is much less affected by dry weather conditions than is the Coe's Creek sand.

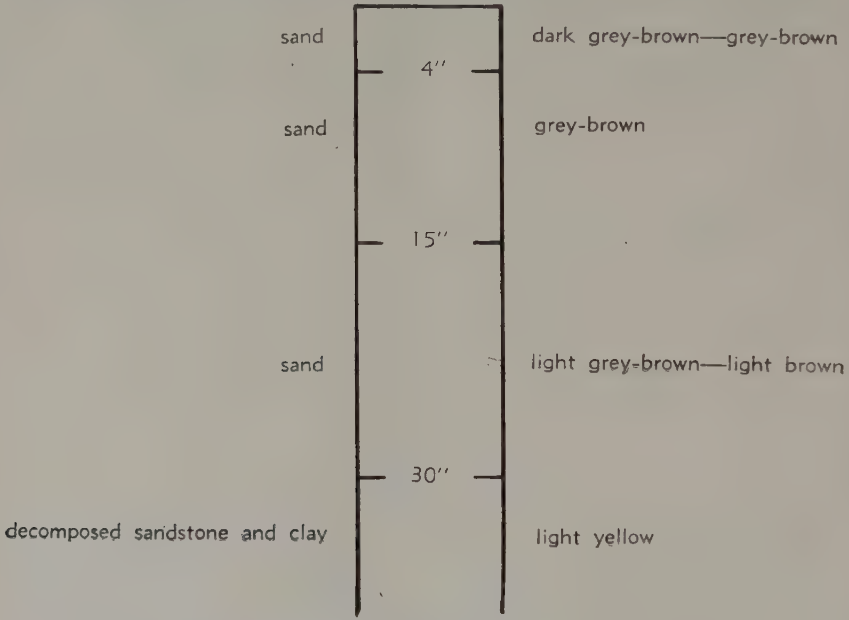
sand
dark grey-brown—grey-brown
4″
sand
grey-brown
15″
sand
light grey-brown—light brown
30″
decomposed sandstone and clay
light yellow

Plate 13.
NAMBOUR SAND.

Nambour Sand.

Of minor importance agriculturally, the Nambour sand is a soil type which is developed extensively in the Nambour-Woombye-Palmwoods area. Although a type name has been given to this soil, it covers a great deal of nondescript sandy country of low value. It occurs generally on a rather coarse-grained, incoherent sandstone. A distinguishing feature is the non-development of a true B horizon, the illuvial material taking the form of a BC horizon. The intimate admixture of the eluviated material with the decomposition horizon gives rise to a zone of highly restricted water movement.

The soil occurs on many steep slopes in the Rosemount area and also in close proximity to the town of Nambour. The general type of profile development is given in Plate 13. Any variation in the field is usually with regard to depth, as the result of erosion. The soil is very sandy to a depth of 30 inches, the coarse fraction predominating. The colour at the surface is dark grey-brown to grey-brown, and this becomes lighter with depth. Below this sandy material is a mixture of rock brash with clay, usually light yellow, mottled with red. Because of its single-grain structure this soil is loose and porous. However, drainage in the zone of root penetration is determined by the depth of the impervious BC horizon and the topography. The moisture-supplying power of this soil is very low and, consequently, it is subject to severe seasonal variation. In this respect it is similar to the Palmwoods sand and Coe's Creek sand.

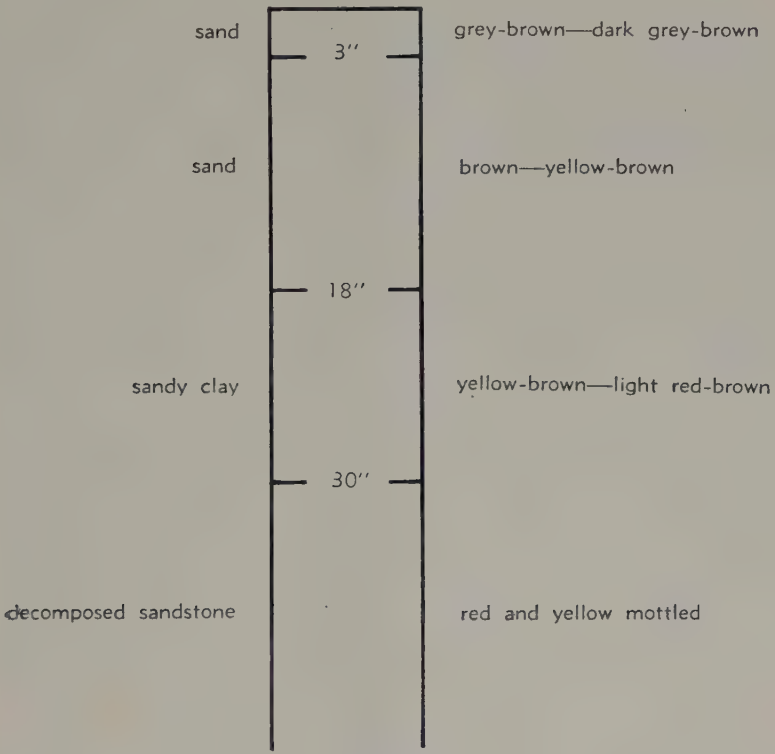

Plate 14.
Rosemount Sand.

Rosemount Sand.

This soil type is of minor importance and is not extensively developed in the districts surveyed. Its main occurrences are in the Rosemount and Diddillibah areas. It is formed from a coarse-grained sandstone somewhat similar to, though slightly harder than, that from which the Nambour sand is formed. It differs from this soil by the presence of a well-developed B horizon. This contains 35 per cent. of clay overlying a less clayey decomposition horizon. The feature which distinguishes it from the other sandy soils of the area is the dominance of a brown colour throughout the profile. In this respect it has some affinity with the Palmwoods sand, but it is much sandier in texture and does not possess the same tendency towards stickiness when wet.

A typical profile is illustrated by Plate 14. The profile is quite sandy to a depth of 18 inches. The colour of the A horizon is grey-brown to dark grey-brown, changing to brown–yellow-brown with depth. There is a marked difference in the textures of the A and B horizons: in the latter the clay content is greatly increased. The colour assumes a reddish tinge and is yellow-brown to light red-brown. Reference to the Appendix shows the very large increment in sesquioxide content in the B horizon, particularly with regard to Fe_2O_3. In common with the other very sandy soils of the area, this soil has a low moisture-retaining capacity.

Rosemount Clay Loam.

The Rosemount clay loam does not find a place in either of the two major soil groups of the area, as the profile of this soil is fundamentally different from those already described. The difference is undoubtedly endodynamomorphic, since the parent material is a rubbly, coarsely-laminated shale. A noticeable feature is the absence of quartz grains in the sand fraction. The fraction of diameter greater than ·02 m.m., but less than 2 m.m., is composed of undecomposed rock fragments, frequently stained red and yellow by ferruginous material. Furthermore, little or no trace of the deep decomposition horizon common to the other soils is evident.

The topography of this soil type is characteristic. The slopes are never abrupt, and the ridge tops are rounded. The vegetation association is that of eucalypt forest, but the tree growth is less tall and of poorer quality than that of the deeper and sandier soils of the area.

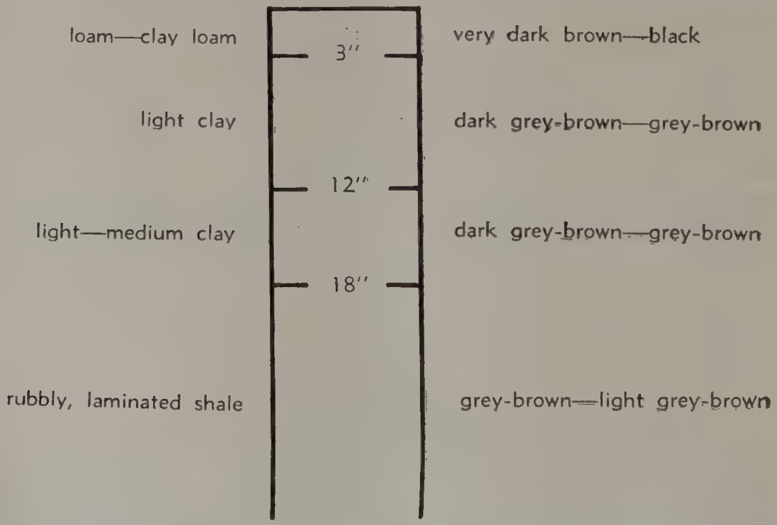

Plate 15.
ROSEMOUNT CLAY LOAM.

The surface soil is a very dark brown to black clay loam or loam. A stable state of aggregation is present, the particles being about 3-4 m.m. diameter. A high organic matter content is characteristic. Although the clay content is considerable, the surface soil breaks free and open when wet; it does not become sticky or plastic except when puddled. In the type profile (Plate 15) the clay content increases slightly in the A_2 horizon, while the colour becomes slightly greyer.

There is a sharp change texturally when the B horizon is reached at a depth of 12 inches. The colloid content increases, giving rise to a light to medium clay. When this material is dry a system of rectangular cracks occurs, but on wetting the swelling of the colloid reduces the pore space. This horizon is one of impeded drainage, and great care should be exercised when planting this soil type to pineapples. The natural drainage of the A horizon must be encouraged by artificial methods, and those areas which are topographically unfavourable should be avoided. By following approved methods it has been demonstrated that this soil can be planted to pineapples with reasonable success.

[TO BE CONTINUED.]

LEGUME INOCULATION.

The practice of including a legume crop in a rotation is common, and the general belief that the productivity of a soil is noticeably better after a legume than after a non-legume is true, but with the important qualification that this is the case only when an association exists between the roots of the host plant and a certain type of bacteria.

When this association obtains, characteristic swellings or nodules are formed on the root system of the host, and it is inside these nodules that nitrogen-assimilating bacteria obtain nitrogen from the air and manufacture compounds containing this element, which are then passed on to and utilised by the plant for growth. Two beneficial results are obtained from this association. Firstly, the legume itself is furnished with an additional nitrogen supply which enables it to make enhanced growth. This is particularly the case with lucerne when efficient inoculation with the appropriate bacteria greatly aids the rapid establishment of a good stand. Secondly, when the legume is turned in at an appropriate time an increase in soil nitrogen is obtained, due to the addition of the nitrogen gained from the air.

Unfortunately, it would appear that these beneficial bacteria are absent from many of our agricultural soils, and under these conditions seed inoculation with a pure culture of the organism—isolated from nodules by bacteriological methods—is essential. These cultures represent a carefully selected strain which has been tested and found to fix nitrogen to the greatest extent, for just as varieties of plants vary in their ability to produce a desired character, so strains of the nodule organism vary in their nitrogen-assimilatory capacity. While some strains may be very efficient in benefiting the host plant, others may be of relatively little value, and still others would appear to give no benefit at all. In addition to this, it is important to note that, while all nodule bacteria have the same general function of fixing atmospheric nitrogen, different cultures are required for different legumes—*e.g.*, a culture of the bacteria suitable for lucerne would be ineffective with cowpeas, and *vice versa*. Similarly, the strain of bacteria which beneficially associates with garden peas and field peas would be ineffective with white or red clover.

Three points, therefore, immediately suggest themselves—that it is incorrect to presuppose the presence of the appropriate strain of bacteria for one legume just because another legume well equipped with nodules has grown before on the same land; secondly, that if moderate or even good stands of a particular legume are obtained there is no reason to assume that a marked benefit would not accompany inoculation of seed with a selected strain for subsequent sowings; and thirdly, that it is highly desirable that only inoculated seed be sown on new land.

The actual operation of seed inoculation is simple, and consists firstly in obtaining a suspension of the bacteria by mixing the contents of the culture bottle with an appropriate quantity of skim milk. To this is added a small quantity of tricalcium phosphate which stimulates the bacteria to a more active stage, and the seed is then inoculated by pouring the suspension over the seed and mixing thoroughly by hand. In this way each seed is covered with a thin film of milk containing large numbers of bacteria.

Complete directions for carrying out the inoculation, together with the quantity of tricalcium phosphate necessary, accompany any inoculum supplied by the Department of Agriculture and Stock. Farmers intending to sow inoculated seed should write, indicating the amount of seed to be sown, at least ten (10) days before sowing is planned, as this time is necessary for the preparation and despatch of cultures.

Contour Furrowing.

A. F. SKINNER, Field Assistant.

THE practice of contour furrowing as a measure of erosion control, and also of pasture improvement, has been attended by considerable success overseas. As contour furrowing is not yet extensively practised in Queensland, the following explanatory notes should be of general interest:—

The Purpose of Contour Furrows.

By conserving free surface water on the land where it falls, contour furrows serve a dual purpose:—

(1) Lowland erosion prevention.
(2) Pasture improvement.

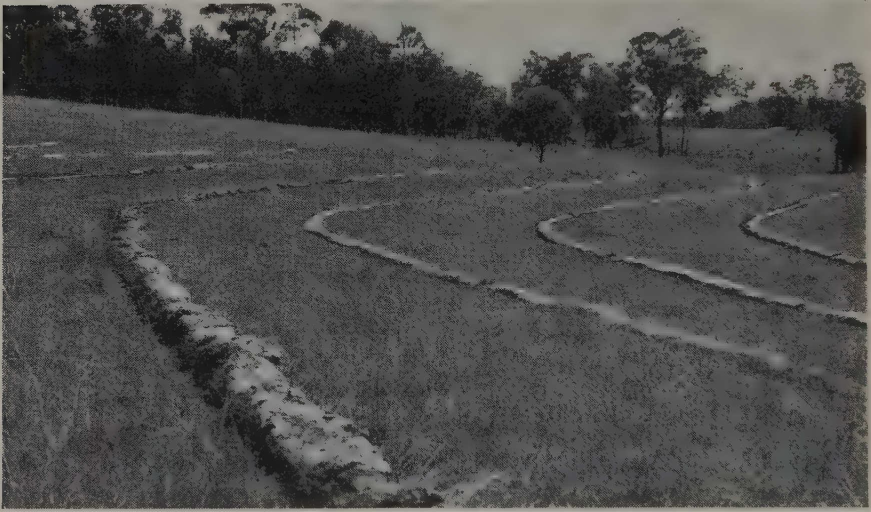

Plate 16.

A FURROWED SLOPE.—Contour furrows reduce the volume of "run off" storm water which often leads to erosion at lower points of concentration. (*Photograph taken on the property of Messrs. D. and J. Healy, Ormeau, Queensland, 27th March, 1940.*)

The volume of surface "run off" water from pastures in a catchment basin may be considerably reduced, and so relieve lower-lying areas of some of the original risk of flooding and injury by erosion. Such upland measures are essential reinforcements to the methods of control applied at lower levels where "run off" concentrates.

The quantity of water held by each furrow has time to soak into the soil, thereby narrowing the normally wide margin of difference between the rate of precipitation and the rate of absorption. Moreover, a more even distribution of water over the whole pasture is ensured. These factors not only stimulate the growth of grass, but also induce the growth of a greater variety of pasture plants.

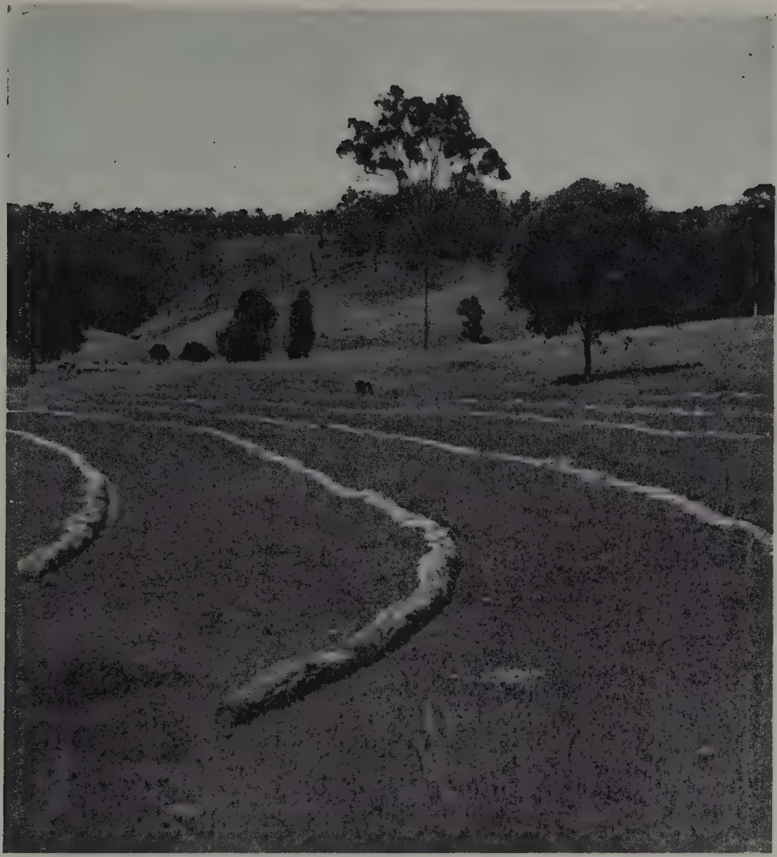

Plate 17.

Water-holding Furrows.—The value of a contour furrow depends on its capacity to hold water. This depends largely on depth, width, and the unbroken condition of the furrow slice.

Definition of "Contour."

To avoid any possible misinterpretation of the term "contour," it will be remembered that a contour is a line on the earth's surface linking all points of equal height. As water always finds its own level, the line traced by the margin of a waterhole is a simple example of a true contour line.

Briefly, a contour furrow is made by the opening of either single or double contour furrows at approximate intervals of from 10 to 20 feet down the slope. When the contour is followed, this spacing will naturally vary throughout the length of the furrows in accordance with the changes in slope of the land. For this reason, it is usual to describe the space between any two furrows as a vertical interval which must remain constant throughout their length. That is to say, a vertical interval of 2 feet between furrows on a 5 per cent. slope is the equivalent of an interval on the slope of 40·05 feet. Assuming that the slope varied to 20 per cent., the interval on the slope would be only 10·19 feet at the fixed vertical interval of 2 feet.

[*Reproduced from Misc. Pub., 338, U.S. Dept. Ag., by E. M. Rowatt.*

Plate 18.

Contour Furrows Stimulate the Growth of Grass and Other Pasture Plants.

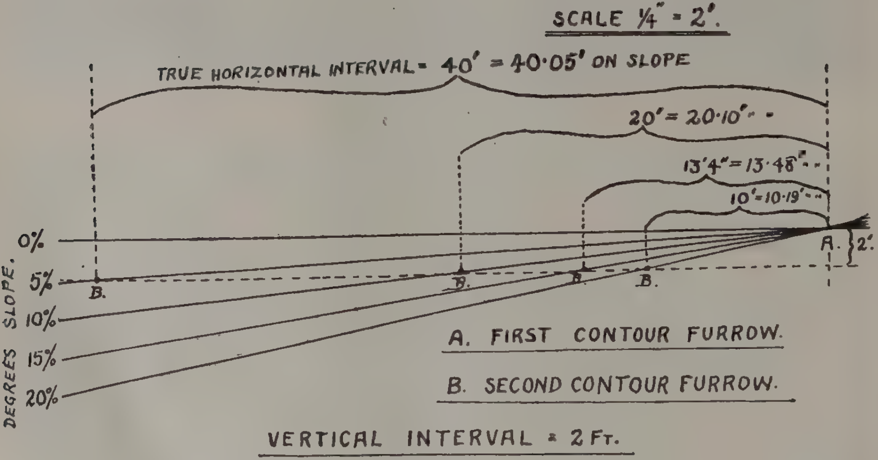
SCALE 1/4" = 2'.
TRUE HORIZONTAL INTERVAL = 40' = 40·05' ON SLOPE
20' = 20·10" "
13'4" = 13·48" "
10' = 10·19' "
0%
5%
10%
15%
20%
DEGREES SLOPE.
B.
B.
B.
B.
A.
2'.
A. FIRST CONTOUR FURROW.
B. SECOND CONTOUR FURROW.
VERTICAL INTERVAL = 2 FT.

Plate 19.

Diagram Illustrating the Variations in Spacing According to Slope between Two Contour Furrows while the Vertical Interval Remains Constant.

A marked reduction in slope will cause a considerable increase in the distance between furrows. In such cases, short intermediate furrows may be opened. The essential point to remember is that the greater the number of furrows the greater will be their aggregate holding capacity.

The area of land temporarily lost to grazing is worthy of consideration. The period of non-productivity may be shortened by doing the work some little time before the wet summer months, when the growth of grass will be most vigorous. Liming, fertilizing, and seeding of the open furrows and turned strip of sod are of undoubted value in promoting rapid and vigorous growth. If the work is done at the proper time, the planting of selected grasses and legumes should be practicable.

Plate 20.

The Unstumped Condition of this Hillside with a 21 per cent. Slope was no Deterrent to Effective Contour Furrowing. (*Photograph taken on the property of Messrs. D. and J. Healy, Ormeau, Queensland, 29th March,* 1940.)

The construction of contour furrows is simple and inexpensive. The fact that the land may not be completely stumped does not prohibit treatment, as it is not essential for the furrows to follow on an unobstructed line. In fact, where such is the case it is a distinct safeguard to break the furrows at intervals of a chain or dam them with a shovelful of sod. The furrow ends should be turned slightly uphill. These precautions are necessary to restrict the draining of water from the furrows in the event of a break or the existence of a low spot in the furrow line.

For the purpose of defining contour lines, a home-made wooden level may be employed.

To use this level, the front leg is moved up or down the slope as required to obtain a level reading on the centre cross-member. The frame is then moved forward, placing the rear leg in the last position of the front leg. By driving a peg at each point, a contour line may be thus plotted.

An ordinary mouldboard plough may be used to open the furrows. A sharp disc coulter is helpful in cutting a clean furrow slice. If the ground is stony, however, a coulter is a disadvantage, as it lifts the plough. For best results on average slopes, the English type of plough with a long mouldboard is recommended. For very steep slopes, a reversible double-disc shave plough is the most suitable.

The furrow slice should be turned downhill on to the edge of the furrow. The less of this strip of sod is broken, the more effective will it be in holding back water. As on steep slopes there is always a tendency for a single-furrow slice to be thrown too far downhill, it is desirable to plough a double furrow. The capacity of the furrow will depend on its width and depth.

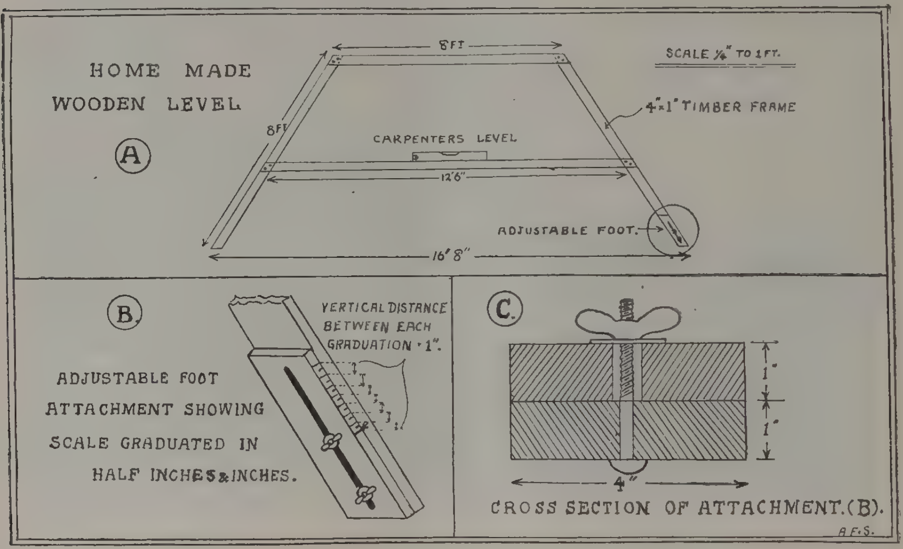
HOME MADE WOODEN LEVEL
(A)
8FT
SCALE ¼" TO 1FT.
4"×1" TIMBER FRAME
8FT
CARPENTERS LEVEL
12'6"
ADJUSTABLE FOOT.
16'8"
(B)
VERTICAL DISTANCE BETWEEN EACH GRADUATION • 1".
ADJUSTABLE FOOT ATTACHMENT SHOWING SCALE GRADUATED IN HALF INCHES & INCHES.
(C)
1"
1"
4"
CROSS SECTION OF ATTACHMENT.(B).
A.F.S.

Plate 21.

HOME-MADE WOODEN LEVELS MAY BE USED SUCCESSFULLY IN PLOTTING CONTOUR LINES.—Six spans of this level cover 100 feet.

A slow and steady pair of horses is of considerable help in turning the best furrow slice without throwing it too far.

It is a mistake to continue the furrow around such obstacles as stumps, logs, or rocks, as this means a deviation from the contour line.

In gullied fields, contour furrows may be successfully turned to keep back water from gullies, thereby checking their further development.

The volume of water that may be stored on a field is of interest. It is here referred to in terms of acre inches. The quantity of water absorbed by the soil while the furrows are still filling is not included. Assuming that the approximate dimensions of an ordinary furrow are 5 inches deep and 8 inches wide, and that the turned furrow slice increases the height of the lower wall of the furrow to 10 inches approximately, 1·75 inches of rain will be conserved on a 5 per cent. slope when the furrows are spaced at 10 feet; 1·16 inches at 15 feet; ·58 inches at 30 feet; and so on.

Greater storage capacity may be provided by increasing the water cross-section area of the furrow. Naturally, the closer the furrows, the greater will be the aggregate holding capacity.

Normally, only a guess can be made at the actual quantity of water absorbed into the soil from a measured precipitation. It will be observed, however, that as a result of contour furrowing the actual retention and absorption of a known minimum quantity can be assured whenever the precipitation is in excess of the aggregate holding capacity of the furrows. Furthermore, the distribution of water over the whole pasture can be largely regulated.

Normally, the penetration of moisture at the foot of a slope is much greater than at the crest, with the result that the higher levels frequently ''give out'' rapidly and are of comparatively poor grazing value.

MANAGEMENT OF WINTER PASTURES.

The choice of a pasture mixture for winter grazing has to be based on a number of factors, including the average winter rainfall of the district, the chemical and physical characters of the soil, the cultivation treatment the land has received, the length of time the pasture is expected to remain, and the aggressiveness of weeds. Once a suitable mixture has been established it must not be considered ''fool-proof,'' but should be managed with due regard to the pasture itself.

The temptation to over-stock paddocks during winter when the ''broad acres'' are unproductive must be resisted. Such pastures should as far as possible be reserved for cows in milk, for breeding ewes, or for fattening stock. The pasture should not be stocked too early in the growing season, but should be allowed to make good growth before grazing. When a paddock is ready for grazing, the animals should be permitted to graze on it for about an hour each day and they should be removed sooner if they begin to lie down. Camping on the area should be prevented, as the pasture becomes fouled and distasteful to the stock. Sufficient stock should be put on to eat a paddock down within ten days or so, but the pasture must not be too closely grazed. ''Flogging'' a pasture of winter grasses and clovers will certainly be harmful. After the completion of a grazing, the harrows or wooden drag should be run over the paddock to scatter the droppings. The pasture must be given ample time to recover and produce good growth before being grazed again. Sufficient paddocks of winter pasture should be provided to permit rotational grazing and to supply green, nutritious feed continuously throughout the cooler months of the year.

Certain of the annual winter pasture plants—e.g., Italian ryegrass, Wimmera ryegrass, and prairie grass—are self-seeding, and toward the end of the growing season pastures of these grasses must be left unstocked in order to permit the seed to ripen and shed. Areas which have been so treated should be lightly harrowed in early autumn to make a seed-bed for the establishment of seedlings produced by the self-sown seed.

Factory Strawberries.

J. H. GREGORY, Instructor in Fruit Packing.

INSPECTION of factory consignments of strawberries during the present season has revealed considerable evidence of carelessness on the part of some consignors. The importance of careful packing should not need emphasis, as it is obviously an essential in successful marketing.

Estimates of production are usually called for during April, and growers are required to state the area under cultivation and the number of plants, so that a reasonably accurate forecast of probable market supplies may be made.

Strawberries should be consigned in half-bushel factory cases, which are obtainable from a local representative of the Committee of Direction of Fruit Marketing, or from its head centre in Brisbane. The cases are debited at 9d. and credited at 8d. on their return filled with factory fruit. Greaseproof paper is supplied with the cases. Strawberries are accepted on a weight basis.

Plate 22.

A CASE OF WELL-SELECTED BERRIES IN GOOD CONDITION WITH NO "NESTED" FRUIT.—A new type of case with a centre partition is now being used.

Standards.

Two grades are taken by factories—canning and jam—the standards for which are:—

Jam.—All fruit must be (*a*) stemmed; (*b*) fully coloured and firm, free from dirt and leaves.

Canning.—Fruit to be (*a*) of a size not less than "fives"; (*b*) stemmed; (*c*) fully coloured, firm, free from dirt and leaves.

There is only a strictly limited demand for canning berries.

Selection of Berries.

Canning.—A special grade of berry is required for canning. The fruit must be sound and firm. A bonus of 1d. a lb. is paid for berries of the desired quality, which is indicated on the label for the guidance of the quality assessor.

Jam.—Berries used for jam-making are usually rejects from fresh fruit market consignments and consist mostly of small and damaged fruit. Smallness is not a detrimental factor. Over-ripe berries by the time they are delivered at the factory are useless for jam-making. Many growers wash their berries, and when this is the practice all berries with broken skins should be rejected, as they quickly develop mould. Berries showing signs of grey mould also should be rejected, as contamination quickly develops from this source. Many consignments of factory berries are unacceptable because of too high a percentage of damaged and mouldy fruit. It does not pay to sort good fruit from bad. Before marketing, growers should give serious consideration to the actual time and handling involved before deciding to include doubtful berries in a factory consignment.

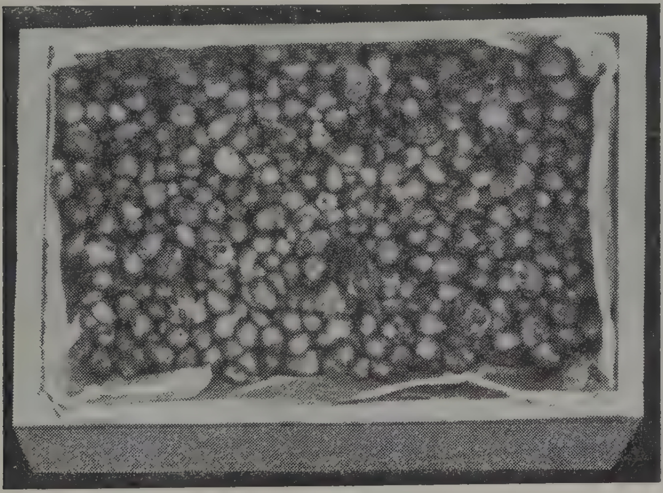

Plate 23.

A Case of Poorly-selected Berries.—Note the "nests" of damaged berries.

Factory Containers.

Containers are supplied by the Committee of Direction of Fruit Marketing, Turbot street, Brisbane. Each case is prepared for the grower and has the tare stamped on it. The lid is leather-hinged, and provision is made for tying the case with twine. Cases should never be tied with wire, as this causes waste of time at the factory. Lids should not be nailed, because of the lightness of the box; otherwise the grower is likely to have the price of the case deducted from his returns.

Labelling.

A label should be attached to all cases with the grower's name and address and an indication as to whether the berries are canning or jam-making. These particulars should be written on the label in pencil and not ink, for during wet weather the ink may wash out. The label should be attached to the case by the twine used in tying down the lid, and not to the case by nailing.

Handling.

Growers and others engaged in packing and transporting factory berries should at all times use care and judgment if the best return is to be obtained, and no deductions made for unsuitable packs.

CUCUMBER GROWING.

The warmth of the climate makes this crop a very suitable one for Queensland. In the coastal and northern districts several crops can be grown during the season.

Planting is carried out usually in the southern coastal districts from September to January, and on the tablelands from October to January; in the northern districts, on the coastal areas from July to January, and on the tableland and inland areas from August to January.

The Agricultural Chemist, in his pamphlet "Complete Fertilizers," states: Cucumbers may be grown on almost any soil so long as it is fairly light and loamy and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil. Apply, in addition to the following artificial fertilizer:—

1½ cwt. sulphate of ammonia or nitrate of soda;

3 to 4 cwt. Nauru phosphate—superphosphate mixture;

1 to 1½ cwt. sulphate of potash;

or 6 to 8 cwt. of a 5-12-5 mixture fertilizer per acre, or 2 to 3 oz. of the same mixture per square yard.

The terms "pits" or "hills" are used to represent groups of four or five plants. At one time the seed was sown always on hills raised above the ground level, but unless the ground is badly drained this practice need not be followed.

Four or five plants are sufficient to a "hill," and the seeds should be placed 3 or 4 inches apart and about 1 inch below the surface. The "hills" should be about 4 feet apart each way, and the whole surface left loosely cultivated.

Should the plants send out their runners to a distance of 2 or 3 feet without setting cucumbers, fruiting may often be induced by pinching out the tips of the runners.

Cucumbers should be harvested when nearly fully grown, before the seeds harden and the skin begins to turn yellow.

The time from planting to harvesting is usually about three months, and 1 lb. of seed set out as directed will plant an acre.

The varieties recommended are: For market purposes Imperial White Spine; for picking Early Green Cluster.

The Recent Burdekin Flood and its Lesson.

By H. W. KERR.*

THE Lower Burdekin district experienced the most disastrous flood in its history, following a cyclonic storm on the 7th April last. Torrential rains fell, and nearly 21 inches were recorded in the district. During the night of the 7th, the Burdekin River rose unusually rapidly, and by the morning of the 8th the water was 20 feet over the railway bridge. It continued to rise during the day, and broke its banks on both the Ayr and Home Hill sides. The rapid rise of the flood waters was, fortunately, not accompanied by loss of life, though there were a number of narrow escapes. Moreover, as little flood water reached the river from its higher tributaries, the subsidence of the stream was also comparatively rapid.

The effects of the cyclone and flood were particularly severe, and a survey of the area revealed the tremendous losses which some farmers had incurred. Not only were buildings and crops severely damaged, but erosion of the stream banks at many points allowed the waters to pour through and create new channels. At this period of the year, many farmers had already tilled their lands in readiness for early planting, while in some cases the fields had actually been planted. The rush of flood water over such lands was, of course, disastrous; in many places the entire surface soil was removed to plough depth, while in others the erosion removed the subsoil strata as well, to a depth of several feet. On certain farms, what were once fertile canefields are now lagoons; on others, the sand scoured by the stream from the alluvial subsoils was deposited from 1 to 6 feet deep in fields of mature cane. In a few instances, mainly on low-lying farms or fields, the checking of the speed of the waters permitted the deposition of silt. This had generally been carried from eroded fields, and it represented the most fertile portions of such lands. Though this valuable deposit was usually only one or two inches in thickness, one farm received a layer of twelve inches on a low-lying field.

Shortly after the calamity, visits were paid to the area by Messrs. Bell and Kerr, of the Sugar Experiment Stations staff. Mr. Bell was delegated to co-operate with local officials for the purpose of estimating the financial loss which the district had suffered. Dr. Kerr later inspected the majority of the damaged farms for the purpose of advising the growers what they might do to overcome the adverse field conditions which have been created. Samples of eroded soils and subsoils, sand and silt deposits, were transferred to Brisbane, where they were analysed, and reports submitted to the growers concerned. On the basis of these results a general report was also prepared and circulated amongst farmers whose lands had suffered damage.

Though, in many cases, the actual permanent damage to the farms may not be so great as was at first anticipated, a large area of what was formerly first class land must be at least temporarily thrown out of production. The irrigation question here introduces a complication from which other cane areas would be free in similar circumstances; and whereas only a small portion of many blocks may have been lost through gullying, the land surface is now so seriously broken that further irrigation of the fields becomes such a problem as to render the practice uneconomic. After a period of years, and when the blocks have been extensively graded, it may be possible to bring them into production once more.

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* In *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations) for July, 1940.

It should be pointed out that the damage done on many forest soil farms, though much less obvious and spectacular than that on the river alluvial lands, is actually much more serious in its effects. With deep silty soils, the loss of even 2 feet of original soil often exposes a fresh surface but little inferior in quality to that removed. But where 12 or 14 inches of grey forest soil is washed away, and a stiff, intractable clayey subsoil is exposed, the rehabilitation of such land would often be so costly and laborious as to render it impracticable. While the Burdekin lands as a whole are notoriously deficient in humus and nitrogen, the forest subsoils are almost devoid of these constituents.

Plate 24.
SHOWING A DEEP GULLY ON A RIVER ALLUVIAL FARM. THIS WAS FORMERLY A FERTILE CANE FIELD.

The analyses of the sandy deposits are very interesting. We have repeatedly pointed out that the Lower Burdekin soils are the richest of all the cane areas of the State: but it was not expected that the sands from the subsoil would exhibit anything like the reserves of plantfoods which were actually found. In no case was a fine sandy deposit tested which could be expected to derive any benefit at all from applications of phosphate and potash; but they do lack nitrogen, and any attempt to grow cane crops on such areas will fail, if due regard is not paid to the supply of this plantfood in the form of suitable manures. The use of dried blood (or meatworks manure) in the drill with the cane plants, followed by two or three top dressings of sulphate of ammonia will be essential for successful crops. The major problem which many of the sands present is their droughtiness, necessitating frequent irrigations: but if the cane crop can be carried along to the point where the roots penetrate the original buried soil, success should be assured. The depth and fineness of the sand is therefore dominant. A light sandy layer on a heavy soil type must, on the other hand, be regarded as an advantage: when ultimately worked into the soil, the production and tillage qualities of the land should be distinctly improved.

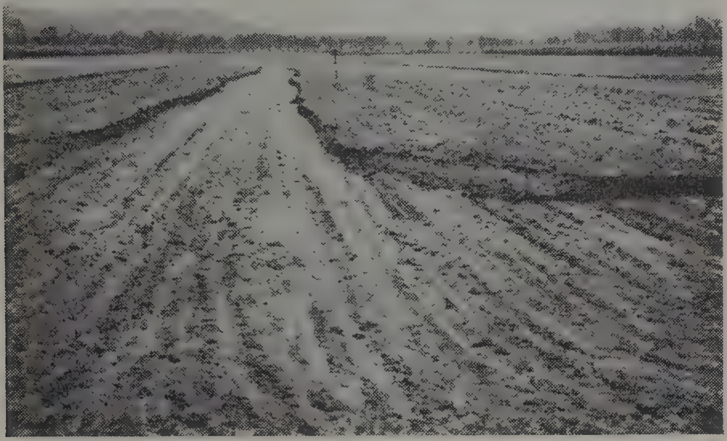

Plate 25.

Illustrating the Manner in which the Surface Soil was Eroded from a Recently Ploughed Field; Forest Soil.

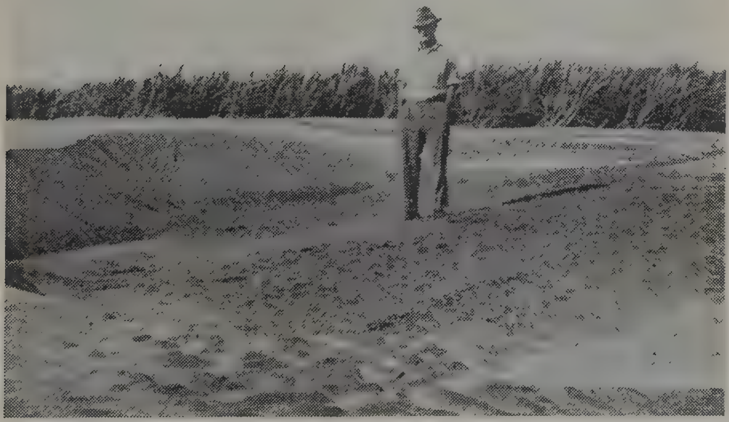

Plate 26.

A Deep Bed of Sand was Deposited on this Fallow Field and in the Adjacent Cane.

Though many farmers have suffered severe losses of both crop and land, and a few farms have been totally destroyed, the greatest menace to the future of the district lies in the presence of some ten or eleven openings in the river bank which would permit even a moderate flood to break through and devastate the farms which lie in the path of the new channels. This is clearly appreciated, and the Government has lost no time in having the situation fully investigated by its officers, so that the danger may be removed.

The Lesson of the Flood.

What has happened this year in the Burdekin area is suggestive of what might befall any of our cane districts should the local streams become suddenly swollen to abnormal dimensions by unusually heavy deluges: and it is well to enquire into the causes of the damage which the Burdekin district experienced to deduce whether the losses were unavoidable, or in how far they may have been prevented; and to what extent clearings of natural vegetation, with cultivation of the land, have contributed to the damage.

Plate 27.
Showing how the Flood Waters Washed out and Destroyed Concrete Water-piping.

The subject of soil erosion generally is one which is daily receiving closer attention by agriculturists the world over. The discussion of the subject at the 1940 Conference of the Queensland Cane Growers' Association was timely, as it served to focus the attention of Queensland cane growers on a subject which has, to date, been treated in only a cursory fashion by those who should be vitally concerned with this menace.

The present problem of the Burdekin district is, primarily, one of preventing the erosion of the river banks, the breaks in which were responsible for the devatasting torrents making their way to lagoons or other low-lying areas. But a study of the results will teach us many useful points which cannot be disregarded.

In general, the banks were most extensively washed away at those points where the natural or artificial vegetative cover had been removed. It was interesting to observe particularly that where the banks were covered by grasses—notably Guinea—the matted roots of these species, combined with the check in flow which the stems offered, assisted very materially in preventing the loosening and removal of the soil. The

Plate 28.
This was formerly a Canefield, carrying an Excellent Plant Crop.

Plate 29.
Showing how an Irrigation Pump and Concrete Piping were Damaged when the Bank was Eroded.

presence of larger trees was also effective in one or other of these directions, and was most effective, of course, where the trees existed in association with Guinea grass, Japanese bamboo, etc. Where the farmer had destroyed the river bank vegetation or disturbed the bank, and particularly where the cultivation was carried to the top of the bank, devastating results followed. Under these conditions a swiftly running body of water readily removes the exposed, undisturbed soil; and where these river bank blocks had been ploughed just prior to the flood, the removal of soil to plough depth encountered no resistance whatever. With soils containing a moderate percentage of clay particles, repeated ploughing to a uniform depth had consolidated the underlying soil or subsoil to such an extent as to enable it to offer definite resistance to erosion, and many blocks of this nature were washed to the depth of the plough pan only; but river alluvial soils, containing a preponderance of silt and fine sand, lack this capacity, and were eroded to a depth of many feet in certain instances.

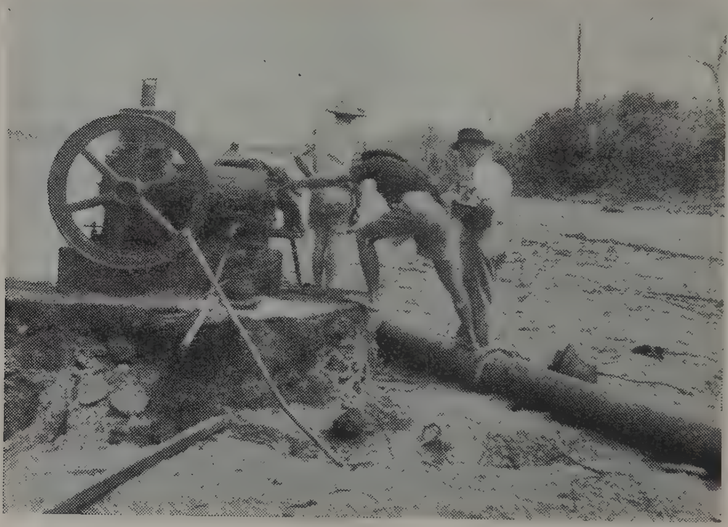

Plate 30.
This Engine and its Concrete Bed were moved by the Force of the Flood.

It was interesting also to observe the effects of the running water when it invaded mature fields of cane. Although the intervening field may have been badly eroded, the waters entering the cane were checked in velocity due to the obstruction of the cane stalks, while the matted roots also held the undisturbed soil together. The net result was a deposition of sand, due to the check in water-flow, but in few instances did such fields lose any soil.

The inference from these observations is clear; at all times the farmers concerned should keep the river banks clothed in vegetation, and Sudan grass appears to offer most in this particular district: cane cultivation should not be carried right to the bank of the stream, but should cease at least one chain further back, and the strip between the cane field and the river should be kept continuously under grass and

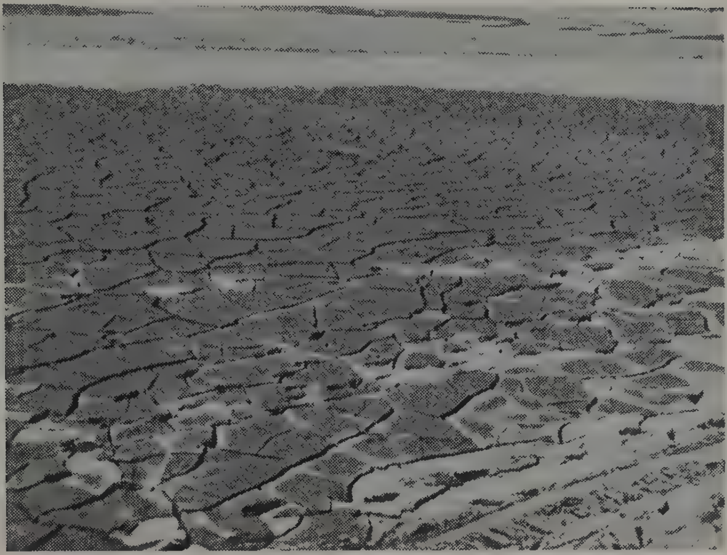

Plate 31.
A Low-lying Fallow Field which has Benefited from a Deposit of Silt.

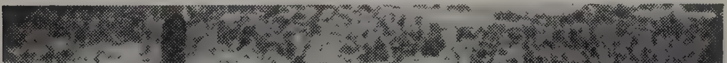

Plate 32.
This Field Received a Deposit of Rich Silt Twelve Inches Deep.

forest cover; finally, it would be a further protection if river bank fields were allowed to remain undisturbed under volunteer ratoon cane until at least May of the year in which the field is to be broken up for planting. Admittedly, the last recommendation would handicap the farmer in the preparation of the land, as well as necessitating late planting; but the presence of the light ratoon growth, on an undisturbed soil, would be definitely effective should a similar emergency arise. In any event, the cane crop makes rapid growth on rich alluvial soils, and under these conditions, also, repeated ratooning may be practised, again to advantage.

Though it is "gully" erosion such as occurred in the Lower Burdekin area which is most striking, farmers should not forget that the less obvious "sheet" erosion, which takes place on every field from which excess water flows at a measurable velocity, is responsible for even more damage over a period of years. An excellent example of the insidious nature of this cause is afforded by hillside areas of red soil, such as occur at South Johnstone and Childers. The decline in fertility on certain farms has already given cause for alarm, and where the process is allowed to go unchecked, the productivity of the land declines at an ever-increasing rate.

This subject is one which has already received the attention of the Bureau, and in the near future one of our officers will make a more intensive study of the causes and effects of existing conditions, and attempt to devise means for their amelioration.

CHECKING SOIL WASHING ON HILLSIDE BANANA LAND.

Cavendish and Mons Marie varieties of bananas are usually grown on hillsides and mostly in soils of a free, fine, shaley nature, which tend to wash very freely. Much of this soil can be saved by placing logs at intervals athwart the slope. On most clearings many logs remain unburnt and can be put to good use in this way.

All the straight lengths of timber up to, say, 8 inches in diameter, will be found very useful in checking the downhill rush of water during heavy rains.

After they have been levered or rolled across the hillsides they should be "anchored" in position against stumps or by stakes and, possibly, large stones. It is not always possible to place them directly across the slope, because of the unevenness of the land, but they will prevent loss of surface soil, even if placed somewhat at an angle.

Where the land is carrying large "floaters" the stones also can be used to advantage by placing them in half circles below the banana stools and filling in the intervening hollow with soil.

When the plantation is in its second year and stripping of the lower leaves or desuckering is done, the material also can be placed with advantage along the logs to aid in preventing erosion.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Cotton Industry

The Planting of Cotton.*

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

ALL seed distributed for the planting of cotton is saved from only the higher grades of pure seed plots of each variety. After the seed is obtained at the ginnery it is first heated at 140° F. to kill all insect life, and a portion of the stocks are then delinted to remove sufficient fibres to allow of the seed being used in "walking stick" hand maize planters in the new scrub burns, and also in ordinary planters equipped with maize plates.

It is strongly recommended that delinted seed be used except where sowing in the dry soil is contemplated. Experiments at the Research Station have demonstrated that with delinted seed a more even distribution is obtained in the ordinary cotton planter, and a lighter rate of seeding can be used—12 lb. of delinted seed giving a germination of 3·7 to 4 plants per row foot, whereas 15 or more lb. of undelinted seed would be required for such a stand. It is recommended, however, that a slightly heavier rate of sowing be used on new cultivations or following fodder crops, for the more open soils will dry out sooner in the upper surface and possibly reduce the amount of germination. A quicker germination is also obtained with delinted seed, as shown in the following data obtained at the Research Station:—

TABLE I.

Seed.	Sixth Day.	Seventh Day.	Eighth Day.	Ninth Day.	Tenth Day.	Eleventh Day.	Twelfth Day.	Plants.
	%	%	%	%	%	%	%	per ft.
Delinted . .	49·1	65·2	69·4	72·4	73·8	75·2	76·3	4·5
Undelinted	7·9	25·7	33·9	40·9	44·9	49·6	52·3	2·0

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* This extract from "Cotton Growing in Queensland," published by the Department of Agriculture and Stock, deals with the planting of a crop of major importance under existing war-time conditions. Copies of this bulletin, which deals with various aspects of cotton production in this State, are obtainable on application.

It is not recommended that delinted seed be sown in dry plantings, for, owing to the ability to absorb moisture better than the undelinted seed, light showers will start germination, and if sufficient rain to complete the strike does not fall the seed will rot, whereas the undelinted seed would be unaffected.

TIME OF PLANTING.

The most suitable time of planting in the cotton districts south of and adjacent to Rockhampton appears to be associated with the soil types. On old cultivations of fertile alluvial loams and clay loams, and on the average of the scrub soils, the best results over a series of seasons have been obtained from plantings made during late September and the first half of October in the Central District, and the latter half of October in the Southern districts. On old cultivations on the heavier clay loam slopes of the forest series, plantings up to mid-November can be made with good prospects of obtaining highly profitable yields. Likewise, plantings can be made later on new cultivations on all soil types; several instances of early December planting have been reported as having yielded excellently. No advantage appears to be obtained by planting in August or early in September, even if climatic conditions are favourable, for the low soil temperatures retard germination, and later rains chill the young seedlings so much that usually early October plantings catch up with them, and often have a much better stand. In some seasons a very heavy loss of terminals occurs in the early September plantings through insect attacks, while later plantings suffer much less damage.

METHOD OF PLANTING.

Several methods of planting cotton seed are used in this State, all of which give good results when favourable conditions exist. In most districts, however, it is believed that the best results will be obtained by waiting until good planting rains occur, harrowing to make a nice mulch, and then planting with a split-wheel type of planter equipped with disc openers. The harrowing not only warms the soil and thus hastens germination, but also checks an early growth of grass and weed seedlings, which is of marked advantage in reducing the costs of cultivation. Undoubtedly this is an important point and one which is not receiving sufficient attention by many farmers. The harrowing before planting is particularly necessary when cotton follows Rhodes grass, for if not done then the grass seedlings germinate with the cotton and soon require hand-chipping.

Growers planting large acreages of cotton are faced with the problem of getting their crops sown so that they will obtain the fullest benefit from the spring rains. As these seldom occur in more than 2-inch storms, and often lighter, it is frequently impossible to get planted on the one storm unless considerable equipment is available. Some growers therefore plant all their acreage in the dry soil prior to the spring rains; others plant half in the dry and half following the first good rains, while others plant as much as the soil moisture will allow following the first rain, and then wait for further rains to complete their plantings. The latter system is preferable in some respects, for it distributes the future operations over a longer period and thus eliminates a peak demand for a large amount of labour in any of the larger cotton districts. The spring rainfall is most uncertain, however, and it is advisable to take full advantage of any rains occurring. It is believed, therefore, that the system of planting a portion of the acreage in the dry and the rest after good rains occur is the best. The proportions depend on the equipment available. Usually sufficient rain falls to allow of planting for at least three days under satisfactory germinating conditions. By planting in the dry all but the acreage that can be handled in three days it is possible to obtain a highly satisfactory strike over a large acreage from the one rain. It is pointed out, however, that the dry planting should be harrowed as quickly as possible after the rain, in order to eliminate weed and grass seedling growth, especially if the germinating rains do not occur until late October or November. The cotton seed will germinate quickly then, and any delay in harrowing may destroy some of the cotton seedlings. It undoubtedly is advisable to harrow the dry planted portion, for each season witnesses growers increasing their cost of cultivation simply through omitting this early harrowing. Dry planting has drawbacks, however, in that in some seasons much loss of seed is experienced through the spring showers being just enough to germinate the seed, after which there are no following storms to establish the seedlings. In wet springs severe crusting of the heavy soils occurs, often in the dry planted areas, even if harrowing is done, and frequently no strike is obtained or one just good enough to influence the growers to leave it, although the stand is not sufficient to allow of the soil producing the maximum possible yield. The problem is a difficult one, and the general district experiences for each soil type are the best indicators of the merits of each method.

Many growers of small acreages in the older agricultural districts, who have maize planters unsuited for planting undelinted cotton seed, have adopted the practice of opening shallow furrows, sowing the seed by hand, and then covering with either a harrow or scuffler. This system undoubtedly causes loss of moisture and undoes the benefit obtained from an early preparation of the seed-bed. It is suggested, now that delinted seed can be obtained, that where an ordinary one or two row maize planter is available, the plates be modified to make them suitable for planting cotton seed. This can be done by enlarging the holes in the six-holed plates and adjusting the gears to allow of the proper rate of seeding.

The provision of delinted seed is of great assistance to the growers in the newly burned scrub areas, for it eliminates the necessity of treating the seed to make it suitable for using in the "walking stick" hand planters. There may be greater danger, however, in sowing the delinted seed in the dry ash before the planting rains occur, on account of the delinted seed germinating with less rainfall than would be the case with treated seed; hence in a spring experiencing light showery conditions considerable replanting might be necessary.

DEPTH OF SOWING.

The correct depth of sowing varies between 1½ and 2½ inches, depending on the condition of the seed-bed, amount of moisture in the surface soil, and the method of planting. The main objective is to get a good stand as quickly as possible. This requires planting the seed just deeply enough to have sufficient moisture to germinate them, and still not have the soil dry out before the young roots penetrate into the moist subsoil. For most soils under average conditions a depth of about

2 inches in moist, firm soil will allow of a good germination being obtained. This is especially true if a split-wheel type of planter is used. Where the seed is covered by scrapers, or by scufflers if planted in shallow furrows, 2½ inches will probably be better, as the soil is not compacted and there is a danger of the moisture being lost before germination is effected, particularly if drying winds are experienced.

If plantings are made at a greater depth than 2½ inches there is always a danger of the seed rotting in a cold, wet spring, and in a dry spring, while germinations may be obtained, the seedlings are frequently so long in coming through the surface that they are thin and spindly and of a pale yellowish colour rather than the usual healthy green. Such weakened seedlings are likely to be attacked by diseases if wet weather is experienced subsequently, and may wither if hot, dry winds prevail for any length of time. Generally speaking, the tendency is to plant too deeply, especially in the plantings in September and early October, when the soil temperatures necessitate quick germination and an early appearance of the seedlings above ground.

SPACING OF ROWS.

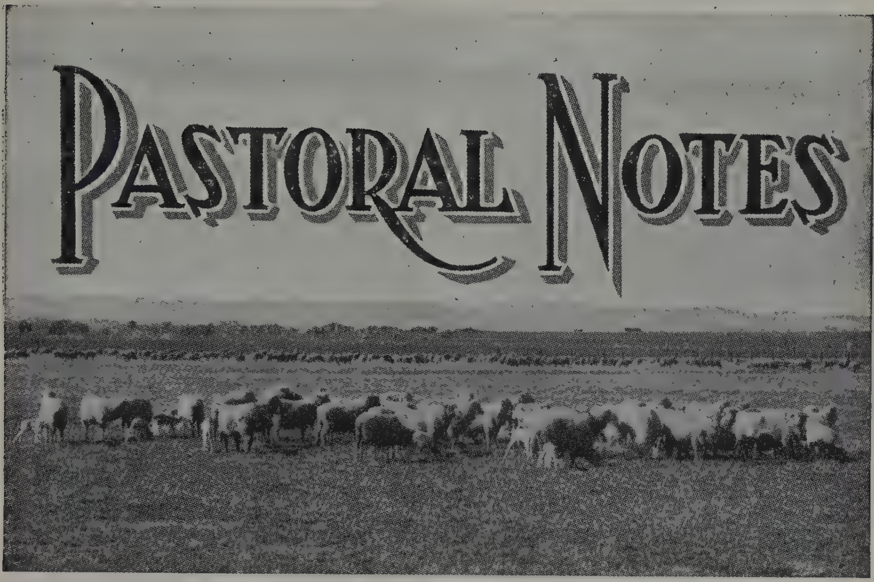
A spacing of 4½ feet between the rows is generally used in all the cotton-growing areas. Widths varying from 3½ to 5½ feet were used at first, but experiments and the general experience of growers indicate that around 4½ feet appears to be a fairly good row spacing for most soils over a series of seasons. It is possible, however, that where cotton is being grown on the clay loam forest slopes away from the immediate coastal areas, a spacing of 4 feet or 4 feet 3 inches may be suitable. Usually the plants do not grow so tall on such soils as on the alluvials; hence under moderate rainfall, ample sunlight and air movement may be obtained with the closer distances.

It is not recommended that spacings smaller than these be tried, for with heavy rainfall accompanied by prolonged cloudy weather in February there is a grave danger of a growth sufficiently rank being made to create dense shade. Experiences of past seasons have indicated that such conditions are conducive to insect attacks, accompanied by heavy losses from boll rots on the lower portions of the plants.

" BY OUR OWN RIGHT HANDS . . ."

Written in November, 1806, after the battle of Austerlitz, where Napoleon crushed Austria, the last remaining ally of Britain, the following lines by William Wordsworth might well have been written in June, 1940:—

"Another year! Another deadly blow!
Another mighty empire overthrown!
And we are left, or shall be left, alone;
The last that dares to struggle with the foe.
'Tis well! From this day forward we shall know
That in ourselves our safety must be sought;
That by our own right hands it must be wrought
That we must stand unpropp'd, or be laid low.
O, dastard, whom such foretaste doth not cheer!
We shall exult, if they who rule the land
Be men who hold its many blessings dear,
Wise, upright, valiant; not a venal band,
Who are to judge of danger which they fear,
And honour, which they do not understand."



The Adaptability of the Merino.

LARGE areas in Western Queensland carry a good covering of high-quality grasses, but are more or less devoid of either shrubs or trees. Fortunately, they are within reasonable distance of other areas which, while similar in other respects, are shaded by a variety of shrubs and trees. Many western holdings include both classes of country, and ewes and growing sheep can be held on the shaded areas, while wethers for wool production are run on the open plains. On holdings where no shade exists, fully-developed wethers are usually purchased from properties more favoured for breeding, and are then run for wool production.

In the southern division of the State, the country ranges from the cold granite and traprock country of the Stanthorpe district, to the rich plains along the New South Wales border. Intermediate types are the poor ridges interspersed between fertile plains, the vast areas of brigalow and belah which were held in the grip of the prickly-pear until a few years ago, and the excellent mulga country in the St. George-Charleville-Cunnamulla and far western districts.

Although the mulga country has a low carrying capacity, it is, when partly improved, suitable for breeding purposes, and supports some excellent stud flocks.

Brigalow country in its natural state is next to useless for sheep. When improved by ringbarking, it generally develops a rank weed growth. By stocking heavily with cattle, the weeds may be kept in check, and, subsequently, will give way to a good mixture of grasses, suitable for sheep. When cleared of excess timber, breeding can then be carried on successfully. As a general rule, however, the land should be seeded down to Rhodes or other suitable grasses after ringbarking.

The granite and traprock country is most suitable for running wethers for wool production. The extreme conditions under which merino wethers can be used to advantage is illustrated by the fact that wethers selected for wool production on the open plains of the West also do well on the high, cold country of the South-east. The type generally favoured for the western plains is a large-framed, plain-bodied, robust sheep which produces a good length of bold-growing, medium to strong wool. Wethers of this type thrive on treeless plains, with no protection of any kind, and suffer no ill effects when the shade temperatures are high for days, and sometimes weeks, at a time.

The sheep selected for the granite and traprock belt of the South-east are usually four tooths of the finer woolled type, but of similar strain to those selected for the West. Each season, after they have been placed on the granite or traprock country, their wool fines down, probably because of a combination of climatic influences and the finer nature and less nutritive quality of the grasses. They do not cut as heavy a fleece as western wethers; but, if kept free from parasites, they do well even on the cold bleak heights ranging up to 3,000 feet above sea level. The adaptability of the merino to such extremes of climatic conditions is quite remarkable.

SUITABLE EWES FOR FAT LAMBS.

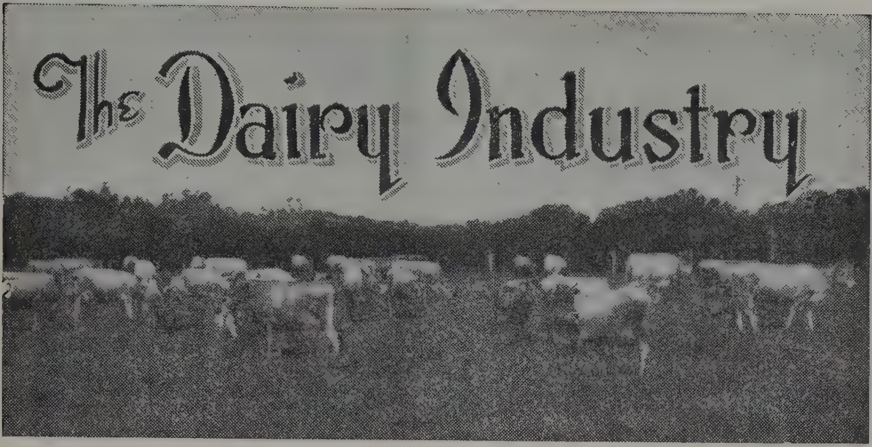
The greatest drawback to the production of fat lambs on the Darling Downs in quantity has been, and still is, the difficulty of purchasing good cross-bred ewes as the mother flock.

If a start has to be made with merinos, the best ewe for fat lamb raising is bred by the introduction of one of the long wools, such as Border Leicester, Lincoln, or Romney Marsh into the strong-woolled, robust type of merino ewe. The ewe lambs of this drop should then be retained as the future dams of the lamb-raising flock.

As to suitable ewes for the fat-lamb industry, it is believed that graziers on the fringe of the Darling Downs or further out would find it profitable to join long-woolled rams of British breed with their cast-forage ewes with the idea of selling the progeny annually as fat lambs ewes on the Downs. Into the crossbred ewe flock, as described, should be introduced a ram of the Downs type. Opinions necessarily differ in the matter of crosses. The South Down is the fashionable lamb at the present time, but it should be remembered that this cross must suffer no check from birth to block. The Dorset Horn gives a very nice lamb, early maturing and hardy. The use of the Border Leicester should be encouraged in every way. In addition to producing an early-maturing lamb that fills every want, it must be remembered that the skin value of this lamb is worthy of consideration to a far greater extent than either the Dorset or the South Down.

Pure-bred Corriedale ewes are hard to come by, but should the opportunity occur a farmer would be well advised not to let it slip. Pure Corriedales are hard to beat, good mothers and heavy milkers, besides growing a profitable fleece.

Generally, the wool from a flock retained for fat lamb breeding is a secondary consideration when compared with the production of fat lambs.



Washing Milking Utensils.

THE general principles underlying the proper cleaning of all metal milk utensils are very simple, and once understood they can be adapted to the requirements of individual vessels and apparatus used in dairying. For this purpose it is essential to understand something of the nature and composition of milk and its products. Milk is a complex substance consisting of water, butterfat, lactose, or milk sugar, casein, albumen, and mineral salts. Cream contains the same constituents in different proportions, so that the problem of cleaning is confined to finding effective methods for the complete removal of fats, sugar, proteins, and salts.

The sugar and mineral salts, being mainly in solution, are almost entirely rinsed away in cold water, which will also remove a large part of the fat and proteins. Butterfat, however, occurs in the form of minute globules, and some of these adhere to the surface of milk vessels and require heat and emulsification before they can be washed off. Of the proteins, casein is in suspension in fresh milk (giving milk its white appearance), but it can be coagulated by acid or by rennet to form a solid curd, the hardness of which is increased by heating; albumen is in solution, but, like egge-white, it is readily and permanently solidified by the action of heat. Both these milk proteins possess considerable adhesive properties (casein is used commercially in the manufacture of paints and glues) and they will, *if the preliminary cold-water rinsing is omitted,* stick firmly to dairy utensils, where hot water washing and subsequent sterilization will only harden them on to the surface. Once fixed there, even in a very thin film, they form a protective layer where bacteria become lodged and breed, and where the sterilizing heat cannot reach them, to the detriment of milk and cream quality. Similar protection is afforded by a layer of fat in the form of grease, which can be tested for by passing a finger over the surface of dairy equipment, and which is caused by using insufficient hot water, water at too low a temperature or the lack of some soap or soda compound to free the fat.

There are, then, three stages necessary to the thorough cleaning of dairy utensils, as distinct from the sterilizing, which must follow in order to destroy the harmful bacteria. These three stages are:—

(1) *Cold Water Rinsing.*—Utensils should be well rinsed as soon as possible after use. This is very important, for milk once allowed to dry is much harder to remove completely. Soaking in cold water for a reasonable time is advisable if washing is not to be done immediately—this will loosen all milk solids and facilitate washing.

(2) *Hot Water and Soda.*—Washing soda, caustic soda, soap or soap powder are suitable cleansers for farm use (besides many proprietary preparations sold under trade names). Care should be taken to avoid cleansers containing any gritty substance, for this will permanently damage the surface by scratching, and will rapidly remove tinning. The water should be really hot, and enough soap or soda should be used to emulsify the grease, so that no globules of fat can be seen floating on the surface of the water. A stiff brush should be used on each utensil and all loose parts such as taps and strainer discs should be dismantled for scrubbing.

(3) *Hot Water Rinsing.*—A final rinse, using fresh hot water, is needed to remove the soda water before sterilizing.

Milk utensils, if not properly cleaned and sterilized, are by far the most fruitful sources of contamination in the course of milking and handling milk and cream, and it should be remembered that both processes are equally essential, for satisfactory and complete sterilization is not possible without first thoroughly cleansing along the right lines.

WET OR DRY MILKING?

Many milk producers, careful in every other way to avoid contamination, still continue the unhygienic practice of wet-handed milking. Moistening the hands with milk direct from the teat, or, worse, by dipping into the milk pail, is a deplorable habit, which is responsible for much contamination as well as loss of quality of milk and cream. It is, of course, more serious if washing of the udder and of the milker's hands have been neglected, for then the dirt becomes intimately mixed with and well distributed throughout the milk. A glance at the accumulation between the fingers of a worker engaged in milking an unwashed cow wet-handed will be sufficient evidence of the truth of this statement.

Where washing of the udder and teats and discarding of the fore-milk have been carried out and the milker's hands have been washed, "wet" milking is less objectionable, but the fact remains that all the cleanest and most efficient up-to-date dairy farmers milk dry handed, and this is a necessity for the production of milk for sale as "Tuberculin Tested" or "Accredited" in England, and for the majority of organised milkers' competitions. "Dry" milking means that the hands are washed immediately before starting to milk and after completing each cow, being left slightly moist after washing, and kept as free from milk as possible.

Some farmers, mostly those who have not persevered with dry milking long enough to give it a fair trial, object to it as being slow and difficult, especially as regards stripping. It has, however, been found by hundreds of others to be equally rapid and simple, after a little practice, provided that the hands are left damp and the teats sufficiently moist after washing to make them pliable.

It is true that there are individual cows with badly-formed abnormal teats, or with one or more sore teats, which are difficult to milk dry-handed. For dealing with these, the clean milker uses a small quantity of ordinary vaseline applied to each teat after washing, which not only serves as a lubricant, but also assists in the healing of the damaged skin, and helps to prevent particles being rubbed off into the milking pail. Teat sores should be treated with some antiseptic ointment between milkings. This also prevents their becoming more serious through being worried by flies. Great care should be taken by the milker to wash his hands thoroughly after each cow, for, obviously, this is a great factor in checking the spread of infectious sores and the transfer of bacteria picked up from the cow's coat, leg ropes, stool, walls, &c., to the freshly-washed udder of the next animal. (If a towel is used, it should be changed often enough to make sure that it is an asset to the hygiene of the milking shed. The clothes of the milker may also constitute a source of danger to milk quality—if, for instance, the same clothes are worn for milking as for feeding the pigs, grooming the cows, and removing manure. A pair of overalls or a sugar-bag apron, kept for milking only, and washed out at least once a week, is within the reach of all.)

Vaseline may be found of assistance to the man who has made a long practice of wet-handed milking when he first attempts the "dry" method, especially in stripping. It is preferable to use vaseline if, by thus easing manipulation, it prevents excessive downward jerking of the teats, which is often resorted to by an impatient milker, and which is not only quite unnecessary, but ruinous to the delicate udder tissues. After a time, however, it will be found that dry milking can be carried out easily and rapidly with no lubricant other than the moisture supplied by washed teats and hands.

This is being done on hundreds of modern dairy farms, where greater efficiency and increased keeping quality are aimed at, and, once established, this method is seen to be far superior to the old, which appears unhygienic, messy, and insanitary by comparison.

CALVING TROUBLES.

Cases of difficult calving are fairly common, and before the usual calving time arrives, a few hints may be useful.

When about to calve the cow leaves the herd and seeks a quiet spot. There she will become restless—getting up and lying down—and show evident signs of pain.

As labour advances the back is arched, the hindquarters are drooped, and straining becomes violent and continous. Meanwhile blood may appear on the vulva and tail, and the waterbags protrude between the lips of the vulva. They increase rapidly and the feet of the calf may be seen within them.

The waterbags furnish a soft uniform pressure for the preliminary distention of the womb and passages, and prepare the way for the delivery of the calf. In normal presentations, it is wrong to break these bags prematurely.

When the cow calves standing up, the navel string breaks when the calf falls to the ground; but, when she calves lying down, the string is broken when she rises. A few hours after calving normally, after-pains commence and the placenta or afterbirth is expelled. If this is not expelled within twenty-four hours, it should be removed by careful traction. A good method is to take two sticks about 2 feet long, between which the end of the afterbirth is grasped, and rotated around them until close to the vulva, when gentle traction is applied, from side to side, and backwards and downwards, care being taken not to break it. A vaginal douche of boiled water at blood heat, to which has been added a mild antiseptic, should be given. A cheap and efficient outfit for this purpose consists of about 4 feet of ½-inch rubber hose and an ordinary funnel. The end of the hose should have its edge pared off with a sharp knife, and, after having been smeared with carbolic vaseline, it is introduced into the vagina, and gently pressed forward as far as the womb. The funnel is then placed in the other end of the hose and held above the cow's back, the douche being poured into it.

It is well, at all times to allow nature to do its work without interference; but, when calving is protracted, and progress is not being made, a careful examination is necessary.

The operator should wear a clean sleeveless shirt, and his arm should be smeared with carbolised vaseline, or an antiseptic oil. This protects the arm from poisoning and the cow from the introduction of infective material into the passage.

The hand should now be introduced into the vagina and a careful examination made. It may be found that (1) the waterbags have burst, and that neither the feet nor head of the calf are presented, or that there is a presentation of (2) one fore foot and head; (3) both fore feet, and head back; (4) head with both fore feet back; (5) one hind foot without the other; or (6) other abnormal presentation.

Whatever part is presented should first be secured by a rope with running noose, so that it will not be lost during subsequent manipulation, and may be readily brought into position when the missing parts are found. If the cow is standing, her head should be turned downhill so that the fœtus and abdominal organs lie forward to give more room to bring up the missing head or limb. If lying down, she should be turned over on to the side opposite to that on which the limb is missing. When the missing part is located, no attempt should be made to bring it up during a labour pain, but after the pain has ceased, an effort should be made to secure it before the next pain comes on.

If the pains are continuous and violent, they may be checked by putting a tight surcingle round the body in front of the udder. If it is found that the passages are dry, pure olive oil may be run into the womb through a rubber tube. If the head is back, the limbs which are presented should be first secured with a rope having a runing noose, then the foetus should be pushed as far back as possible and an attempt made to secure the head with a noose or hook, and to bring it up into the passage. Having brought the limbs and head into a suitable position, traction should now be applied in a downward and backward direction, but only when the cow is straining.

Pulling when the cow is not straining should not be attempted. Patience and care are necessary. The extraordinary practice of attaching a draught horse or motor-car to the fœtus and pulling it out by sheer force is not only cruel, but usually results in the death of both the cow and the calf. After a protracted calving the cow will be exhausted, and she should be provided with a warm rug and bed, also a few bottles of warm gruel.

Points to remember are—

Do not interfere too soon.

When interference is necessary, exercise patience and take time.

Do not use force until the fore feet and head or the hind feet are secured in position.

Remember to pull only when the cow is straining.

DAIRY FARM COMPETITION.

The 1939-40 Dairy Farm Competition under the auspices of the Royal National Agricultural and Industrial Association of Queensland resulted as follows:—

1. Major B. C. Bell's Blackrock farm, Coochin, Boonah.
2. Mr. E. D. Lawley, Arley, Maleny.
3. Mr. W. Aplin, Cloverdale, Maleny.
4. Mr. H. H. Napper, Pimpama; Mr. L. Nicholls, Redlands, North Tamborine (equal).

The competition provided for inspections in April, 1939, October, 1939, and March, 1940, and the prizes were awarded to the farms which showed the greatest improvement over the period of inspection.

The judging had regard for the following points:—

1. *As affecting the dairy herd.*—The use of a Herd Book registered sire with good dam production record, type and conformation of the herd, the quality and care of the stock bred on the farm, the health of the cattle, herd-recording and production, recording, and the pig section of the dairy farm.
2. *As affecting the layout of the farm.*—The layout of the paddocks, condition of fences and gates and water facilities, the dairy premises, milking yards, the care and condition of the dairy plant and utensils, the farm buildings, drainage and provision for conserving rain water, horse-farming machinery and general plant, including its care and condition, the layout of the buildings and the general tidiness of the farm, and shade and shelter trees.
3. *Regarding the pastures—conservation of fodder.*—The competition specially covered the provision of sown pastures, topdressing of natural pastures and renovation and topdressing of paspalum pastures, conservation of fodder (including hay, silage, or grain), farm crops in their relation to stock foods and methods of feeding.
4. *The practical results* arising from the *economic working of the farm in its relation to its capital value* and the profitable application in dairy farm sidelines, such as poultry, bees, vegetables, fruit.

The final judging was undertaken by a Judging Committee—Messrs. A. M. Hunt, E. B. Rice (Acting Director of Dairying, Department of Agriculture and Stock), J. A. Heading, and H. W. Watson. In the preliminary judging the committee was greatly assisted by the reports of the dairy inspectors of the Department of Agriculture and Stock in their respective districts.

Blackrock Farm, comprising 350 acres, was previously part of Coochin Coochin Station. The cultivated paddocks include 70 acres of maize and pumpkins, 40 acres of lucerne, and 20 acres of oats. All crops were well grown, and had been assisted by the correct admixtures of required fertilizer. A great quantity of lucerne hay is stored in a well-built hayshed; the maize stored in tanks was easily the best maize feature seen on any farm. The dairy herd comprises eighty very good purebred and grade Jersey cows, and there are sixty well-bred sows on pasture. The link between the dairy and the piggery on this farm is remarkable, and had achieved excellent economical results. The milking yards and accommodation for the brood sows are extensive, and the drainage well done. The farm contains the most recent improvements of any farm inspected. The judging committee was impressed with the enterprise of Major B. C. Bell in establishing such soundly managed farms under his control—viz., Blackrock Farm, Lagoon Farm, Coochin Farm, and Aroo Farm. Each farm contains almost similar characteristics, carrying about eighty cows and sixty brood sows, but Blackrock farm stands out as the property carrying the more recent improvements.

Arley, Maleny, comprises 84 acres, subdivided into seventeen paddocks, all paddocks, other than the cultivation paddocks, opening into the receiving yards adjoining the milking bails. The herd comprised twenty-nine A.I.S. registered cows of exceptional dairy quality, and both bulls were from Advanced Register cows. Mr. Lawley exhibited the champion A.I.S. bull at the 1939 Royal National Show. The bails are exceptionally good, with extensive concrete floors; even a small cowyard had been concreted. A water scheme, with a creek as the source of supply, provides an efficient service for the home, the dairy buildings, and the piggeries. Pig pens, calf bails, feeding stalls, and requisite services are soundly constructed and planned. Paddock land, 35 acres in area, has been stoned. In general neatness and tidiness, the farm home surroundings and dairy buildings are exceptionally impressive.

Maleny is a good farm of 200 acres, subdivided into twenty paddocks, which have been topdressed and renovated. The bails and dairy buildings are well built, and the recording system is excellent. Veterinary instruments and aids are a very valuable part to the dairy farm plant. A good herd of seventy-five cows is pastured on this farm, and the two Jersey bulls are from registered dams. Much fencing has been renewed, and electric fences are in use and are effective in the subdivisions of pig paddocks and pastures. A hot-water system, the planting of shade trees and windbreaks, an ample timber stack were other features which interested the judges.

Pimpama and *Redlands*, North Tamborine, gained fourth place with an equal number of points.

Pimpama is a very good 200-acre farm with facilities and conveniences which the supply of electric light and current to rural areas has made possible. The dairy buildings are in very good order, the bails and yards being in a somewhat difficult hillside position. At every shed large storage tanks had been installed and an adequate water supply ensured the general cleanliness of the dairy buildings. The grasses on this farm are paspalum and clover, Kikuyu, and Rhodes. The dairy herd comprises about seventy well-bred Illawarra cows and two very well-bred sires. Electric lighting in outbuildings and electric fences, even in cattle subdivisions, are features of this farm.

Redlands is 68 acres in area, subdivided into sixteen paspalum paddocks. All the land had been cleared within five years. There are two springs on the property, one well, and five cultivation paddocks. The herd is pure-bred Jersey, all T.B. and C.A. free. The sire was imported from Victoria, and his dam showed 500 lb. butter-fat production. Mr. Nicholls tests his own cattle, and has had no second-grade cream. The dairy buildings were judged as the cleanest premises seen in the competition; the tidiness of the farm buildings called for special commendation. The pastures are mainly paspalum, which had been topdressed and superphosphated to great advantage. There are 30 tons maize silage in a good plaster silo constructed by the farmer. Oats and field peas were grown together, and there were good maize and root crops. Salt and iodine lick were in the bails, and sterilised bonemeal was available in an automatic feeder at the exit of the bails. This property stood out remarkably in the allocation of those points affecting the economic working of the farm in relation to the capital value of the property.

There were thirty-seven entrants in the competition, and the dairy farmers concerned are to be commended for efforts made to improve their farms along the general lines specified in the points scale. The judges were pleased to notice the practice on many farms of providing aids for the maintenance of the health of the stock.

In the non-prize-winning farms the following commendable features were observed:—

1. A profitable poultry section run as a sideline to a dairy farm.

2. A pasture farm of 292 acres divided into twenty-nine paddocks provided an excellent example of rotational grazing and pasture management on a property on which cultivation is impracticable.

3. A well-conducted dairy farm with a productive and well-laid-out vegetable garden.

4. A farm on which a neat stack of 500 new fencing posts is kept ready for repairs.

5. A farm on which 130 tons of lucerne hay are stored.

6. Several mountain farms on which appropriate grasses had been planted to bind watercourses to prevent erosion.

7. Several farms on which special attention has been given to the housing of brood sows.

8. On most farms the homestead and farm buildings had been painted.

9. One farm with an extensive electric-lighting installation comprising lights in the cowbails, the engine-room, and hayshed, as well as eight points in the home.

10. A farm with a complete machinery and implement plant.

◆

THE COWYARD AND MILK AND CREAM QUALITY.

Numerous experiments in various countries have shown that so long as the cowyard and floor of the milking shed are kept clean, the bacteria which fall into the milk from the air have not such a contaminatory effect as might be expected. This is because the germs transported on dust particles, unless they are resistant species, are destroyed by the exposure to direct sunlight, absence of moisture, and scarcity of food. Fortunately, too, such hardy species only bring about slowly changes in milk.

Inspection of dairy premises on any day may reveal, however, that there is a lack of appreciation by many farmers of the potential contamination to which milk or cream may be subjected if produced and held in surroundings in which the cowyard is not kept as clean as practicable. If manure be allowed to accumulate, dry, and become pulverised in the cowyard, the movement of the animals and the wind will soon distribute dust particles literally teeming with millions of objectionable bacteria, many of which will lodge in the dairy utensils during milking. The milk or cream, if subsequently held in such a dust-laden environment, should be conveyed as soon as possible after milking to a covered milk stand or dairy well away from the yard. Incidentially, manurial bacteria—known technically as the coliform bacteria because of their normal habitat being the colon, or large intestine, of animals—are the most undesirable organisms in cheese manufacture, giving a pin-holey curd and off-flavour to the infected cheese. They also may cause the de-grading of cream—*i.e.*, gassy or fermented cream.

Two other factors which cause contamination on some farms because of direct exposure of the utensils and milk to a dust-laden cowyard atmosphere are—

(1) The placing of utensil draining and storage racks alongside the cowyard fence. (If, on a windy day, a finger is wiped on the inside of the utensils, even when they are turned upside down, in such an environment the serious contamination of milk subsequently placed in the utensils will be apparent.)

(2) The practice, adopted by some suppliers to cheese factories, of leaving the night's milk on a stand near to the cowyard fence instead of keeping it as prescribed by the Dairy Regulations.

Both these practices are strongly condemned. Regular attention to the cowyard to prevent the accumulation of manure in such close proximity to the bails also assists in minimising fly infestation. Flies entering milk carry into it innumerable germs. Regular limewashing of the bails helps in checking the fly pest.

It should be remembered, moreover, that cow manure is too valuable as fertilizer to be wasted in the cowyard. Daily heaping of manure should be a routine duty in every cowyard. It takes only a few minutes to clean up—in fact, cleaning-up of the cowyard is a requirement under the Dairy Produce Act.

The PIG FARM

How to Make a Rope Pig-net.

In compliance with numerous requests, the subjoined notes on the making of a pig-net, by Mr. E. J. Shelton, Pig Section, are reprinted from the Journal for September, 1938:—

WHEN transporting pigs in an open wagon or truck, a net or cover of some type is required. The rope-net illustrated herein is the type usually recommended for the purpose. It is convenient to use, cheap, durable, and easy to make and keep clean.

It is not a sunshade, however, and will not protect pigs from the sun when they are exposed to its direct rays. This suggests the necessity of providing some form of shade or protection for pigs in transit, even if it is only a few green bushes or a hessian or bag cover.

The method of making a pig-net is simple. The materials required are hemp or manilla rope, a length of softwood or hardwood board rounded at the edges, 12 to 18 inches long and of the same width at both ends. This piece of board is referred to by net makers as the mesh stick, its principal use being to keep all the meshes the same size. In actual use a mesh stick 2 inches wide will make a 4-inch mesh; a 3-inch stick a 6-inch mesh, &c. The objective is to have the stick half the width of the mesh it is intended the net shall carry.

In measuring the meshes it is necessary to draw them out to a diamond shape. The 4-inch mesh is preferable for bacon or pork pigs, a smaller mesh for suckers and weaners. Where fishermen set out to fashion a fishing net they use a long needle and the cord is held on a reel or short length of board, but in the case of a pig-net the rope had better first be rolled up in the same way as the ordinary rope clothes-line or sash cord is when purchased; it will then be a simple matter to pass the hank of rope through the loops when making the knots at the corner of each mesh, for the knotting is rapidly performed by an experienced worker.

In setting out to make the net, first tie a loop in one end of the rope as in A, Fig. 1. Place this knot on a strong spike or hook attached to a post or wall or some other convenient place as at A in Fig. 2. Now place the mesh stick under the loop as at B, put the rope around the mesh stick, then pass the rope through the loop and pull rope tight, proceeding to place the thumb of the left hand on the rope beyond the loop as at A in Fig. 3, and with a turn of the wrist of the right hand throw the rope to the position shown at B. Next pass the rope behind the loop C, and then through the bight of B and down as at D; draw knot tight, which should now assume the shape indicated in Fig. 4. This figure shows the knot made loosely to enable the method of making it to be clearly seen and readily understood. The rope must be held firmly with the thumb at A, Fig. 3, when pulling up the knot, as on this depends the uniformity of the shape and size of mesh.

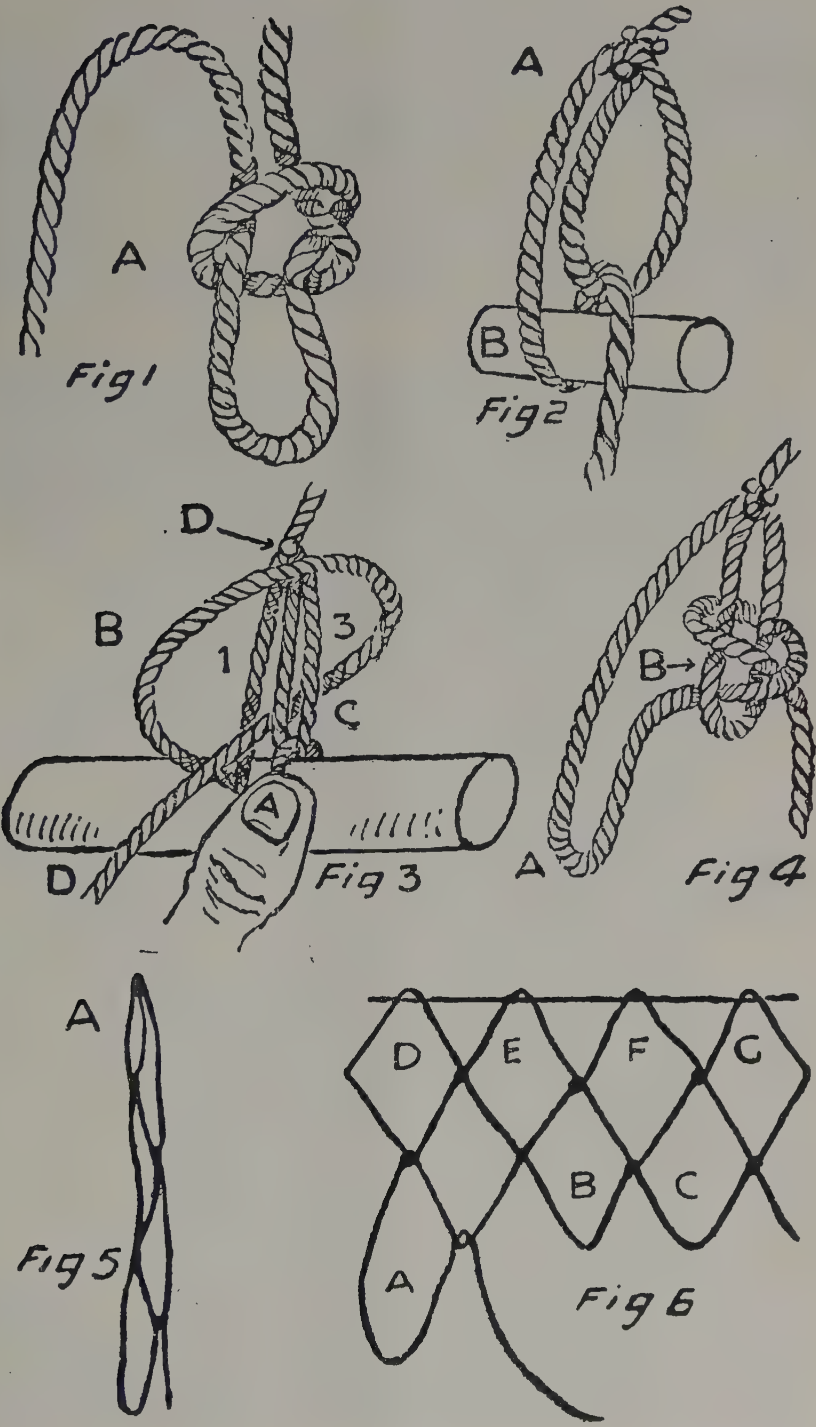

A
Fig 1
A
B
Fig 2
D
B
1
3
C
A
D
Fig 3
B→
A
Fig 4
A
Fig 5
D
E
F
G
B
C
A
Fig 6

Plate 33.

To continue the netting, the stick is withdrawn and placed under A, Fig. 4. The rope is then passed around the stick as in Fig. 2 and brought through the loop A, Fig. 4, and the process shown in Fig. 3 is repeated to form another mesh, this being continued to make a chain of meshes, say, the width of the conveyance to be used when transporting the pigs to rail or sale. The loop A, Figs. 1, 2, and 5, first tied is then untied and it will be found that all the meshes are equal in size. Next, the chain of meshes is opened out at right angles to the line in which it was made, as shown in Fig. 6; in other words, remove the chain of meshes from a vertical position as in Fig. 5 and place them in a horizontal position as in Fig. 6. A line is run through the meshes D, E, F, G and secured between two posts to hold the net while continuing the meshing. Working across is then begun by making a mesh at A, Fig. 6, then at B, C, and so on until the length of the first lot of meshes has been reached, when the right-hand side of the net is turned around and placed where the left-hand side was and the left-hand side placed where the right-hand side was. Another row of meshes is started on the left-hand side (facing the net) and worked until the one under A has been reached on the right-hand side.

The net is turned again, and another row of meshes commenced on the left-hand side, and so on until there are enough rows of meshes to cover the vehicle. To secure the net to the vehicle use rope plough lines, and reeve them through each mesh and around the side and end rails of the body of cart. The method described herein of making the meshes is the same as is used in making ordinary hammocks.

The net and bags used for shade should be at least 1 foot above the backs of the pigs, otherwise the net may rub and injure the flesh and blister the skin. Every possible care and attention should be given to see that this does not happen.

In loading, secure the net on both sides and in front, first leaving a good length of plough rein free to tie the net to rail of tailboard when pigs are loaded and vehicle is clear of the loading race.

For the information of those who prefer to purchase a ready-made pig-net, the following details will be of interest. This quotation is from the Poultry Farmers' Co-operative Society Ltd., Red Comb House, Roma street, Brisbane:—

	s.	*d.*
Pig-nets—		
6 feet by 4 feet, N.Z. hemp	12	3
7 feet by 5 feet	18	0
In pure manilla rope—		
6 feet by 4 feet	17	0
7 feet by 5 feet	25	3

Railage ex Roma Street, Brisbane, would have to be allowed for; this would not exceed 2s. 6d. for each net. Manilla rope varies in size and price—approximate price, 1½d. to 3½d. per yard. The size of the rope is measured by the circumference not the diameter.

CASTRATION OF PIGS.

Male pigs should be castrated while they are very young, so that they may be fit for slaughter on attainment of the correct weights. The age recommended for the operation is six weeks, or two weeks before they are weaned.

As many beginners do not know how to perform the simple operation of castration, the Department of Agriculture and Stock has made available, free of cost, a very useful and well illustrated pamphlet—"Castration of Pigs"—which gives detailed instructions in convenient form and in everyday language.

Demonstrations may be arranged, on application, in the course of the instructors' itineraries, either at gatherings where facilities exist for performing the operation, or at a slaughter-yard where young pigs are available. In the latter case it is preferable to demonstrate on a pig carrying more age—say, up to four months—and which can be killed and dressed beforehand. Demonstrating on a dressed porker simplifies procedure, and enables the instructor to explain it without the inconvenience of handling a live pig.

That a better knowledge of the operation of castration is essential is emphasised frequently by bacon curers, meat exporters, and slaughtering inspectors, who often come across carcases of male pigs which have been castrated improperly. Partial, if not total, condemnation of the hindquarters—the result of abscess formation, the formation of tumours in the scrotum, callous or improperly healed tissue, or some other abnormality—is the inevitable result.

Castration should be done during cool dry weather and before flies—blowflies in particular—become numerous. Absolute cleanliness in all details, proper equipment, healthy growing pigs, and a correct knowledge of the job are necessary for success in the performance of the operation.

Plate 34.

QUEENSLAND CO-OPERATIVE BACON ASSOCIATION.

Standing: Directors J. Hardcastle, W. Beckmann, R. L. Boyd, R. E. Stephens, C. A. Stock.
Sitting: A. C. K. Cooke (Vice-Chairman), James A. Heading, D.C.M., M.M. (Chairman), H. W. Sanderson (Manager).

Registered
Hatcheries

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven	White Leghorns
A. F. Buchler, Milman	Pincrow	White Leghorns
J. Cameron, Oxley Central	Cameron's	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled	Rhode Island Reds
B. Cross, Apple Tree Creek, Childers	Spring Hill	White Leghorns, Australorps, and Langshans
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield	Woodville	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
W. Easson, Formosa road, Tingalpa	Grassdale	White Leghorns and Anconas
E. O. F. Eckert, Laidley	Laidley	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner	Australorps
Elks and Sudlow, Beerwah	Woodlands	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Grice, Loch Lomond, via Warwick	Kiama	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
S. W. Kay, Cemetery road, Mackay	Kay's	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale	Nuventure	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore	Stonehenge	Australorps and White Leghorns
W. J. Martin, Pullenvale	Pennington	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels	Australorps
J. A. Miller. Racecourse road, Charters Towers	Hillview	White Leghorns
F. S. Morrison, Kenmore	Dunglass	Australorps, White Leghorns, and Brown Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale	White Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
S. V. Norup, Beaudesert rd., Cooper's Plains	Norups	White Leghorns and Australorps
H. W. and C. E. E. Olsen, Marmor	Squaredeal	White Leghorns, Black Leghorns, Australorps, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central	Pennefathers	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's	Australorps
J. Richards, Atherton	Mount View	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra	Australorps and White Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge	White Leghorns
E. Searle, New Cleveland road, S.Tingalpa	Tingalpa	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
J. Steckelbruck, The Gap, Ashgrove	Cosy Nook ..	White Leghorns and Australorps
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps
P. and K. Walsh, Cleveland ..	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Atherton ..	Weaver's ..	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby ..	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps
R. H. Young, Box 18, Babinda	Reg. Young's ..	White Leghorns, Australorps, and Brown Leghorns

Plate 35.

LAKE MANCHESTER, NEAR BRISBANE.

Agricultural Notes

The Preservation of Concrete on the Farm.

CONCRETE floors and feeding troughs on the farm often show signs of wear soon after being laid down, a fault which is often due to the action of various acids in milk and some other foods. If the farmer does nothing to prevent further wear, the concrete becomes pitted and quickly breaks up.

This deterioration of the concrete may be delayed successfully by the correct use of a special type of silicate of soda, which is cheap and easy to apply. When mixed with water the solution thus obtained is sprinkled on the surface of the concrete to be treated, is absorbed, and combines with the concrete, forming a tough coating which is impervious to water and acids under ordinary farm conditions.

One gallon of the special silicate of soda is thoroughly mixed with 4 gallons of water. The 5 gallons of solution will suffice for three applications to an area of 300 square feet of average concrete. Very dry or porous concrete will require a fourth application.

In making new concrete floors, the work should be finished off so that the surface is not very smooth, otherwise the stock will be liable to slip when it becomes wet. When the concrete is firm and nearly dry the solution of silicate of soda in water is applied by means of a spray pump, a watering can with a fine sprinkler or a mop. Do not flood the solution on, but apply just as much as the concrete can absorb readily. A second, and later a third application of the solution should be made as the surface dries out each time. For new concrete three coats should be sufficient.

Worn floors and troughs may be renovated in the following way:—First, the surface should be thoroughly scrubbed with soap and hot water to remove grease and dirt. Then the area is coated over with a mixture of one part cement to three parts clean, fine sand. When the concrete is firm and drying, treat with the silicate of soda solution as for new concrete.

Floors and troughs in sound condition will benefit by treatment with silicate of soda. The surface should be freed from grease as before mentioned; four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining on the surface should be removed with a mop.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should receive a light treatment once each year following the initial treatment.

When purchasing silicate of soda for conditioning concrete, the purpose for which it is to be used should be definitely stated to ensure obtaining the correct material.

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PNEUMATIC TRACTOR TYRES.

During recent years the use of rubber tyres for tractors as well as farm implements and vehicles has made marked advances, and in Queensland to-day many new units are purchased with this equipment. In overseas countries they have been even more extensively applied, and cane growers will doubtless be interested in a review of a Bulletin recently issued in Iowa, United States of America, which sets out to summarise performances of some 200 tractors fitted with pneumatic tyres. These had been in use for periods up to five years, and were operated for a number of purposes under a variety of conditions.

Considerable variation existed in the rate of tyre wear; avoiding excess slippage was stressed in order to assure a long service. The estimated useful life varied from three to fifteen years, with an average of seven; in terms of hours of service, this amounted to 6,765.

Estimated fuel savings, in comparison with steel wheels, averaged 22 per cent.; the estimated saving in labour was 23 per cent. Fifty-four per cent. of the farmers reported the use of a higher gear for most operations.

The new high lug treads were reported as being generally more satisfactory, particularly for adverse traction conditions. The use of water to increase the wheel weight was found generally satisfactory.

The main advantages claimed by users were: Reduced fuel and labour requirements; higher speeds; easier operation on hard-surfaced roads, meadows, and pastures; decreased tractor breakage and wear, and greater comfort.

The chief disadvantages were: Higher first cost; possibility of delay and expense from accidental damage; the expense of equipping at least part of the drawn equipment with rubber tyres; lower maximum drawbar pull under many conditions; excessive bouncing under certain conditions; more objectionable tracks in loose tilled soil, and decreased stability for belt work.

The most effective use of a rubber-tyred tractor requires the highest practicable speed, the widest implement which can be pulled satisfactorily by the engine and tyres at this speed, and enough wheel weight to provide effective traction.

Over 98 per cent. of users were satisfied with the performance of rubber tyres, and most were agreed that they showed satisfactory durability and field performance.

H.W.K.

(In *The Cane Growers' Quarterly Bulletin* for July.)

GRAIN SORGHUMS ARE DOWNY MILDEW RESISTANT.

The exigencies of disease control work have compelled the control of maize plantings in the Bundaberg area. The high susceptibility of maize to sugar-cane downy mildew is now well known by all growers who have had experience with this serious disease. It must be recognised, however, that in this district cane is the major crop and maize the minor one, and it would be foolhardy to continue paying levies to the Disease Control Board for the eradication of downy mildew in cane, while wholesale plantings of the more susceptible maize were still allowed in diseased areas.

The question of replacement of maize by a more suitable fodder and grain crop arises, and the possible answer appears to be in grain sorghums. The growth of grain sorghums is in its infancy in this district, but the varieties so far tried have distinct promise. It is suggested that growers endeavour to obtain small supplies of seed for an early spring planting. The varieties differ in type; some are leafy and are more suitable as green fodder, whereas others are less leafy and are best for grain production. They are very heavy grain producers, and their principal value over a maize crop lies in the fact that they will ratoon. The grain is—in the best types—about three sixteenths of an inch in diameter and is round. American literature states that the feeding value is very little below that of maize.

The grain sorghums we have tested so far are highly resistant to downy mildew—in fact, no symptoms of the disease have been discovered in them at all, although subjected to heavy infection from surrounding diseased cane.

The grain is easily separated from the heads by means of a peg drum. During the wet months of this year a crop of grain sorghums on the experiment station was badly affected by peach moth after coming into head. Earlier plantings will be made this year to see whether the attack will be escaped by controlling the time of planting.

It is anticipated that supplies of seed of four or five of the most suitable varieties for the area will be available in the coming spring. Interested farmers should communicate with the Director of Agriculture, Department of Agriculture, Brisbane, at that time.

N.J.K.

(*The Cane Growers' Quarter Bulletin* for July.)

MIXED SEEDLINGS OF GREEN MANURES.

While Poona pea has become highly regarded as a green manure species in practically all cane districts, it is appreciated that its early maturing character is a handicap in the wetter areas of the State. Under these conditions many farmers are successfully using a mixture of Poona pea seed with giant cowpea to overcome the drawback. Two bushels of giant cowpea with one bushel of Poona pea provides a satisfactory mixture. The Poona pea gives a rapid early cover and controls weeds; while the prolonged growth period of the giant pea enables the farmer to turn under a good mass of green matter towards the end of the wet season.

It should be noted that if a Poona pea crop perishes after it has made its growth, but before it can be ploughed under, not all of the benefits of the crop are lost, as many farmers suppose. The supply of nitrogen which it has accumulated still remains in the dead leaf and stems, or is washed into the soil by the rain after the death of the plants. Unquestionably, best results will follow where it is possible to turn the crop under at the height of its succulent growth.

H.W.K.

(*The Cane Growers' Quarter Bulletin* for July.)

RATIONING OF POTASH.

DURING the war of 1914-1918 potash imports—an essential farm fertilizer requirement—ceased. The potash-producing districts of the world were in enemy occupation.

At the outbreak of the present war, a measure designed to conserve and control supplies of materials essential to agriculture was enacted by the State Parliament, in anticipation of conditions arising which might interfere with imports of essential substances. This measure is known as *The Agricultural Requirements Control and Conservation Act.*

At the same time, action was taken by the Minister for Agriculture and Stock and interested importers to build up reserves of potash against the possibility of a future shortage.

The Act gives power to control the sale and use of any material gazetted as an ''essential agricultural requirement,'' and, generally, to ensure that the quantities of materials on hand will be used to the best advantage of the State.

Soon after the passing of the Act, potash and sulphate of ammonia—both fertilizing materials—were gazetted as essential agricultural requirements, and provision was made for the immediate operation of this legislation if deemed necessary.

When war broke out, France and Palestine were the chief sources of supply of potash to Australia. Germany and Spain had been eliminated from the field. France also has now ceased to be a source of supply, and because of the expected heavy drain on Palestine supplies and the difficulty of obtaining goods from Mediterranean countries, it is not certain that further supplies of potash will be obtainable.

Because of the supply accumulated, however, and of the Act and machinery designed to deal with the situation, Queensland will be able to use potash in her agricultural industry for—it is estimated—approximately two years, without relying on further imports.

An Order in Council has been issued under the Act setting out the method by which potash will be conserved. In brief, the following are its main requirements:—

Potash must not be sold or used as a straight fertilizer—that is, it must be purchased in a mixed fertilizer with other ingredients.

No potash may be sold or used in a mixed fertilizer for any crop other than sugar-cane, pineapples, bananas, tobacco, vegetables, potatoes, strawberries, cotton, citrus fruits, deciduous fruits, papaws, custard apples, passion fruit, and avocadoes.

No sulphate of potash may be sold or used in a mixed fertilizer for any crop other than pineapples, tobacco, potatoes, and strawberries.

In fertilizer mixtures for sugar-cane, up to 14·5 per cent. potash is allowed on the red volcanic soils—which are low in potash—at Babinda, Innisfail, Childers, and Bundaberg; no potash is allowed in the Burdekin area—where potash in the soil is adequate—and up to 7·5 per cent. potash is allowed for cane in any other area.

In fertilizer mixtures for bananas, up to 6 per cent. potash is allowed, and for pineapples up to 10 per cent.

In fertilizer mixtures for cotton, potash is allowed only with special permission of the Department of Agriculture and Stock.

With all other crops for which potash is allowable, but for which a specific percentage is not laid down, up to 7·5 per cent. potash is allowed.

A tolerance of 10 per cent. is allowable over the maximum percentages of potash declared to be present—that is, the excess of potash over the amount guaranteed in any fertilizer mixture sold or used must not be more than one-tenth.

Power is given to the officer charged by the Minister with the administration of the Act to give written permission to allow potash to be sold and used in exceptional cases.

Officers have been appointed under the Act in order to put the requirements outlined into effect; these officers include the principal officer in charge, the deputy of this officer, and inspectors.

This rationing scheme has been drawn up by officers of the Department after very careful consideration of every aspect of the matter, and buyers who are not receiving their usual amount of potash in mixed fertilizers should realise that the interests of Queensland as a whole are being served by rationing.

Here are the details:—

AGRICULTURAL REQUIREMENTS CONTROL AND CONSERVATION ACT.

RATIONING OF POTASH (FERTILIZER) SUPPLIES.

An Order in Council issued under the abovementioned Act restricts the sale and use of potash in all its forms.

The following provisions are included:—

Potash in any of its forms must not be sold or used as a straight fertilizer—that is, it must be sold or used in a mixed fertilizer with other ingredient/s.

The sale and use of potash in the culture of crops is restricted, as set out in the following table, taking into consideration only the present available forms of potash—namely, sulphate and murite:—

Name of Crop and Area where Cultivated (where Applicable).	Forms of Potash Allowable in Fertilizer Mixtures.	Maximum Potash Allowable in such Fertilizer Mixtures.
		Per cent.
Sugar-cane—		
Ayr Petty Sessions District (Burdekin)	Nil	Nil
Red volcanic soils in the Petty Sessions Districts of Cairns, Innisfail, Bundaberg, and Childers	Muriate only	14·5
Other areas	Muriate only	7·5
Pineapples	Sulphate and Muriate	10·0
Bananas	Muriate only	6·0
Tobacco Potatoes Strawberries	Sulphate and Muriate	7·5
Vegetable Crops Citrus Fruits Deciduous Fruits Papaws Custard Apples Passion Fruit Avocadoes	Muriate only	7·5
Cotton	Muriate only	7·5. Only by permission of Principal Officer in Charge
Other Crops	Nil	Nil

In particular cases other than as set out above, the principal officer in charge may authorise the sale and use of potash.

Any person who contravenes or fails to comply with any requirement of an Order in Council under the Act is liable to a penalty of not more than £200, and, in addition, to a penalty of not more than £50 for each and every day during which the offence is committed.

It should be noted that this statement is explanatory only; the full legal requirements are as set out in the Order in Council gazetted under *The Agricultural Requirements Control and Conservation Act* on 13th July, 1940.

Horticultural Notes

The Planting of Bananas.

THE best aspect for banana-growing is one varying from easterly to northerly, and even north-westerly, provided that the plantation is well sheltered from strong winds. As southerly slopes are usually cold, banana plants, if grown on them, develop slowly, and the fruit is generally inferior; hence land with a southerly aspect is not worth considering if other land is available.

Logging and hoeing operations should, if possible, be followed by a thorough grubbing. Grubbing is essential if the plantation is to be established in forest soil. It is necessary for the aeration and drainage of the soil and the maintenance of a supply of moisture for the plants. Many growers look askance at forest soils for bananas, but plantations on such soils, if worked thoroughly and desuckered carefully, can produce fruit of first-class size and quality.

It is now possible to plant bananas in many localities. If bits or butts are being utilised, careful attention must be paid to baiting for the banana weevil borer to ensure the planting of clean material. Growers in need of advice on the selection and preparation of planting material should get in touch with the nearest fruit inspector or banana agent.

Holes for planting should be, roughly, about 15 inches square by 15 inches deep. The surface soil from the top side should be raked back into the hole and the sucker placed in the loose soil and tramped firmly all round. The top of the sucker need only be covered lightly with loose earth, and the hole should not be refilled completely.

An application of about 1 lb. of fertilizer when planting will hasten and strengthen the growth of the young plants. The actual time of planting will depend on the conditions in the different districts. On a slow-growing aspect, October planting is best, while on warmer slopes November and December may be more suitable.

Where grubbing has not been done previously a circle around each plant with a radius of approximately 3 feet should be worked. This gives the plant both sufficient sunlight and freedom from smothering weeds. Planting 10 feet by 10 feet is a good average distance.

Generally, the best method of spacing followers is that known as "one bunch one follower." This enables the grower to regulate and handle his fruit cutting and packing with convenience, as it is more or less confined to the winter months. For about the first twelve months after planting, all but one or two followers should be kept back, and thus all energy is directed into one plant and its bunch. The folly of allowing as many suckers as may appear to develop cannot be condemned too strongly.

MARKETING BANANAS.

During hot weather, bananas which have been cut and left exposed to the sun for only a short period soon become quite unfit for sale, and the pulp is eventually reduced to a soft, ''boiled'' condition. Cutting should be done in the early morning, before the heat becomes severe, and care should be taken to keep the fruit covered completely, even from the early morning sun, while waiting to be carried or wired to the packing shed.

The fruit should at all times be handled with the greatest care—in fact, the less it is handled the better—and for this reason it is wise to have the packing shed right in the plantation, if possible. On cutting the bunch it should not be laid carelessly at the foot of the stem, which usually means it rests on a bed of sticks and dead weeds. A bed of leaves is easily and quickly formed if the bunch must be set down in the plantation, although a better plan is to carry it straight into the shed or to the end of the wire and there place it upright on bags or trash with the stalk leaning against a rail provided for the purpose. In this way, possible damage will be reduced to a minimum.

On being dehanded, the fruit should be allowed to ''drain'' for a few hours. Packing immediately after dehanding sweats the fruit in the case and makes bruising much easier. Care should be taken to ensure that fruit which is ''sprung'' or in the early stages of ripening is not packed, as it will quickly be reduced to pulp and be unsightly in a case of otherwise sound bananas. No fruit should be packed for Southern markets from bunches in which some of the fingers are already showing colour indicating ripening. The fruit should be dehanded just at the collar joining the fingers to the main stalk. The most suitable knife for this work is one of a sharp, flexible, and very narrow type.

There is a right and wrong way to separate the hands into singles, if a ''single'' pack is desired. Tearing the bananas apart endways often peels part of the skin from the fruit and also bruises the stem, thus setting up an entrance for organisms which cause blackend. The correct method of separating into singles is to grasp the cluster firmly with both hands at the stem end, then twisting one hand forwards and the other backwards, the fruit is separated easily and without any damage to the stalk end.

On completion of packing the cases should be placed on their sides in a cool, shady position to await transport to rail or market.

Should it be desired to use the ''cluster'' pack, the same method should be adopted, separating three or four instead of the single finger. If a cluster of three or five is used, a single banana should be added to make it a four or six. The secret of clusters is to have the fruit in twos.

CUTTING TALL-GROWING BANANAS.

The cutting of bunches of tall-growing varieties of bananas frequently presents a difficulty to growers who have not had previous experience in growing these varieties, such as Mons Marie and Lady's Finger.

The following very simple method, and one which can be worked successfully by one man, is recommended:—

On the same side of the stem as that on which the bunch is hanging make two cuts with a cane knife, about 5 to 6 feet from the ground. The cuts are made one downwards and one upwards, and should meet, making an angle of about 60 degrees, approximately two-thirds of the distance through the stem, or deep enough to sever the bunch stalk in the centre of the stem. Immediately this is done, the upper portion of the stem with the bunch will not fall suddenly to the ground, but will slowly bear over, and as it gradually comes within reach the bunch is grasped and cut.

The principle of this method is that the soft fibrous tissue of the unsevered portion of the stem does not break suddenly, but because of its flexibility allows the bunch to heel over gradually. The V-shaped wedge also assists in this way: it cushions the lower and upper portions of the plant, and only gives way steadily and partly crushes under the increasing strain as the bunch nears the ground.

When cutting the stem, care should be taken to sever the bunch stalk. The tissue of this stalk is very brittle, and will snap readily. If this stalk is only partly cut, the weight of the bunch pulling the plant over will cause the unsevered portion to snap, and this sudden snapping will invariably result in the remainder of the stem also breaking and the bunch falling heavily to the ground, to the detriment of the fruit.

TABLE BEETS.

The beet will grow well in most soils, but, like other root crops, it does best in a light loamy soil. The soils should be prepared thoroughly and enriched with liberal dressings of well-rotted stable manure or vegetable matter.

Commercial fertilizers may be used, and the Agricultural Chemist advises the following mixture:—

Sulphate of ammonia	1½ to 2 cwt.
Superphosphate	2 to 3 cwt.
Muriate of potash	¾ to 1 cwt.

A complete fertilizer, 2-12-6, also, may be used at the rate of from 4 to 6 cwt. to the acre.

The fertilizer should be applied at the time of thinning if the seed has been sown where the plants are to remain; or otherwise at the time of transplanting. A top-dressing about a month later with sulphate of ammonia at the rate of 1 to 2 cwt. to the acre would be beneficial.

As the seed is usually sown in the field, it is necessary to have the soil in a fine state of tilth prior to planting. The seed is customarily planted in rows about 2 feet 6 inches apart for horse cultivation, or 1 foot 6 inches apart for hand. Six to 8 lb. of seed is usually sufficient to plant an acre, or 1 oz. to every 150 feet. It should be sown to a depth of from ½ inch in heavy ground to 1 inch in light soil. The seed is usually slow in germinating. The distance between plants may vary from 3 to 4 inches, according to variety sown. Thorough cultivation is necessary after planting out, and until the plants are a fair size care must be taken not to injure them with the implements or heavy clods of earth.

Beets should be harvested when of suitable size for market. They are usually washed and tied in bundles of about six. Varieties recommended are—Nonpariel, which has a long oval shape; and Crimson Globe—a turnip-rooted, early beet, suitable for hot districts.

Plate 36.

CLOSE TO THE JOB.—Swedish rototiller at work mixing fertilizer with the soil on Benyenda Citrus Orchard, near Gayndah.

THE FRUIT MARKET.

J. H. GREGORY, Instructor in Fruit Packing.

COLD weather has slowed up fruit sales to some extent. Fruit also is harder to ripen at this time of the year. In the colder South, these conditions are, of course, intensified. Queensland growers are asked to cease sending green pineapples, papaws, and tomatoes to market. All of these fruits may be allowed to show colour with safety. Excellent consignments of strawberries are being marketed, but factory supplies leave much to be desired. Suppliers persist in placing a percentage of soft and damaged berries in each box. This percentage, on arrival in Brisbane, is sufficient to cause rejection. Notes dealing more fully with this trouble are published elsewhere in this issue. Custard apples are now nearing the end of their season. Firm values have been maintained throughout. Frosts have been heavy, and damage has been caused to beans, peas, and tomato crops. Prices for these crops should remain firm during most of the marketing season.

Ruling market prices during the last week of July, 1940:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 13s. to 18s.; Sixes, 13s. to 20s.; Sevens, 15s. to 23s.; Eights and Nines, 18s. to 24s.

Sydney.—Cavendish: Small, 14s. to 18s.; Sixes, 14s. to 20s.; Sevens, 16s. to 22s.; Eights and Nines, 20s. to 28s.

Melbourne.—Cavendish: Sixes, 19s. to 22s.; Sevens, 21s. to 23s.; Eights and Nines, 23s. to 25s.

Adelaide.—Cavendish: Sixes, Sevens, Eights, and Nines, 25s. to 30s.

Newcastle.—Cavendish: Sixes, 23s. to 24s.; Sevens, 25s. to 27s.; Eights and Nines, 29s. to 30s.

Bunches, 5d. to 8½d. dozen.

Growers would be well advised to allowed the fruit to fill as much as possible before harvesting.

Lady's Finger.—1d. to 10½d. dozen.

Sugars.—2d. to 4d. dozen.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 5s. case; choice, to 7s.; loose, 1s. 6d. to 5s. 6d. dozen; Ripley, 4s. to 5s. case; loose, 6d. to 2s. 6d dozen.

Melbourne.—Smoothleaf, 8s. to 10s.

Some poorly coloured green lines of fruit are being received, to the detriment of market values.

Adelaide.—Smoothleaf, 14s. to 18s.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. to 4s. 6d. bushel; Local, 2s. 6d. to 3s. 6d.; Specials higher.

Sydney.—9s. to 15s. tropical case.

Melbourne.—Ripe coloured, 13s. to 15s.; Green, 8s. to 12s. Sales slow. Fruit hard to ripen.

Some green lines being received. These will not ripen satisfactorily at this time of the year.

Custard Apples.

Brisbane.—4s. to 5s. half-bushel. Poor grades lower.

Sydney.—8s. to 10s. Poor lines lower.

Melbourne.—8s. to 10s.

Monstera Deliciosa.

3s. to 4s. 6d. dozen.

Avocados.

Brisbane.—5s. to 7s. 6d. half-bushel.

Granadillas.

5s. to 10s. dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 4s. to 7s. 6d.; choice higher; Commons, small, 3s. to 4s.; large sizes to 7s.

Mandarins.

Brisbane.—Emperor, 2s. 6d. to 8s. Many lines soft and washy. Ellendale, 10s. to 14s.; Glens, 8s. to 12s.; Scarlets, 3s. to 8s.

Sydney.—Glens, 8s. to 10s.; others, 5s. to 8s.

Melbourne.—9s. to 12s.

Most interstate lines of mandarins are showing signs of reaching full maturity.

Grapefruit.

Brisbane.—5s. to 8s. bushel.

Melbourne.—5s. to 12s. bushel.

Lemons.

Brisbane.—Small, 4s. to 6s.; Choice, 7s. to 10s.

Melbourne.—10s. to 16s. bushel.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 5s. to 10s.; French Crab, 3s. to 7s.; Granny Smith, 7s. to 11s.; Democrat, 6s. to 9s.; Delicious, 7s. to 11s.; Sturmer, 5s. to 7s.; Aromatic, 5s. to 7s.

Too much small fruit has been received on the Brisbane market, particularly varieties such as French Crab, which are not popular at any time.

Pears.

Brisbane.—Gleau Morceau, 8s. to 11s.; Packhams, 8s. to 11s.; Winter Cole, 8s. to 13s.; Winter Nelis, 6s. to 10s.; Josephine, 8s. to 11s.

OTHER FRUITS.

Strawberries.

Brisbane.—4s. to 8s. dozen boxes; some specials higher; 4-lb. boxes jam, 1s. 9d. to 2s. 6d.

Tomatoes.

Brisbane.—Ripe, 4s. to 6s.; Choice coloured to 7s. half-bushel; Small ripe, 2s. to 3s.; Green, 2s. to 4s. half-bushel.

Sydney.—4s. to 6s.; Specials to 8s.

Melbourne.—West Australian, 7s. to 12s. per case.

Passion Fruit.

Brisbane.—First grade, 8s. to 12s.; Seconds, 5s. to 7s.

Melbourne.—8s. to 10s.

Cape Gooseberries.

6d. to 7d. lb.

MISCELLANEOUS, VEGETABLES, ETC.

Cucumbers.—6s. to 8s. bushel.

Pumpkins.—4s. to 5s. bag.

Marrows.—1s. to 4s. dozen.

Lettuce.—1s. 6d. to 2s. dozen.

Cabbages.—2s. to 3s. dozen; small lower.

Cauliflowers.—5s. to 12s. dozen.

Beans.—Brisbane, 3s. to 7s. bag; Sydney, 4s. to 8s. case; Melbourne, 2d. to 3½d. lb.

Peas.—4s. to 8s.; choice higher; Melbourne, 4d. to 5d. lb.

Beetroot.—3d. to 9d. bundle.

Chokos.—4d. to 10d. dozen.

Parsnips.—9d. to 1s. 6d. bundle.

Carrots.—3d. to 9d. bundle.

Celery.—South Australian, 12s. to 16s. crate; Local, 1s. to 1s. 6d. bundle.

Rhubarb.—8d. to 1s. 6d. bundle.

Plate 37.

YOUNG FARMERS AT THE SYDNEY SHOW.—The group includes members of Queensland Project Clubs chosen to represent the State at the New South Wales Junior Farmers' Movement Camp on the Sydney Showground, under the leadership of Mr. J. P. Kahler, Project Club Organiser of the Department of Public Instruction.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of June, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Callangulong Aster	C. Fleming, Callangulong, Jondaryan	7,768·85	435·599	Nestle's Royal Badge
Corunna Dainty (243 days)	J. H. Anderson, Southbrook	11,329·66	435·153	Gambol of Wilga Vale
Fairlie Chance 7th (236 days)	Sullivan Bros., Pittsworth	10,236·03	389·151	Rosenthal Carbine
Wakeful of Glen Eva	E. O. Jeynes, Raceview	10,274·15	386·669	Cork of Oakvale
Murray's Bridge Shamrock	A. T. Paull, Bowenville	8,102·03	373·342	Valiant of Greyleigh
	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Evansvale Olive	J. F. Evans, Malanda	10,771·2	353·24	Malanda of Glenore
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Valera Milkmaid	Sullivan Bros., Pittsworth	6,693·56	303·576	Kilbirnie Royalist
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Envy 26th of Blacklands	A. Pickels, Proston	7,835·15	345·531	Parkview Viceroy
Rosenthal Lilac 9th (241 days)	J. H. Anderson, Southbrook	7,871·45	328·958	Rosenthal Credence
Applegarth Evelyn III.	W. Nicholas, Monto	7,761·15	324·357	Greyleigh Crowner
Valera Bonny 2nd	Sullivan Bros., Pittsworth	8,318·47	311·238	Kilbirnie Royalist
Ardilea Kitty (238 days)	W. Henrichsen, Ardilea, Clifton	7,102·75	283·058	Midget Sheik of Westbrook
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Fairlie Princess 34th	C. B. Mitchell, Fairlie, Rosenthal	6,137·93	275·698	Rosenthal Credence
Fairlie Fairy 12th	C. B. Mitchell, Fairlie, Rosenthal	6,138·5	260·646	Rosenthal Credence
Trevor Hill Patty	Geo. Gwynne, Umbiram	6,348·71	231·257	Corunna Supreme

JERSEY.

	MATURE COW (STANDARD, 350 LB.).			
Ocean View Wait-a-while Fairy	J. Sigley, Millaa Millaa	8,247·35	435·552	Rocky Glen Wait-a-while
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Westbrook Tulip 70th	Farm Home for Boys, Westbrook	8,015·65	428·65	Oxford Golden Dreamer
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Trecarne Jersey Maid 3rd	T. Petherick, Lockyer	7,271·78	431·724	Trinity Some Officer
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Meadowvale Magnet	Young Bros., Proston	5,874·2	300·407	Banyule Development
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Trecarne Eileen 7th	T. Petherick, Lockyer	7,001·1	460·773	Trinity Some Officer
Trecarne Safety 2nd	T. A. Petherick, Lockyer	6,299·1	381·292	Trinity Some Officer
Kingsford Frances	W. E. C. Meier, Rosevale, Rosewood	6,477·05	318·719	Trinity Ambassador
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Oxford Sybil III.	E. Burton and Sons, Wanora	6,504·45	361·242	Oxford Peer
Kingsford Angeline	W. E. C. Meier, Rosevale, Rosewood	5,430·8	302·84	Oxford Aster's Remus
Oak Park Titania	J. Nowlan, Lindum	4,933·85	282·872	Banyule Lord Tiddlewinks

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VETERINARY MEDICINE REGISTRATIONS.

The Registrar of Veterinary Medicines, Mr. F. B. Coleman, has supplied a further list of veterinary medicines, which have been registered under "*The Veterinary Medicines Acts*, 1933 *to* 1938," for the period January, 1939, to December, 1941.

List No. 3 (supplementary to List No. 2 issued December, 1939).

	Reg. No.
Buzacotts (Queensland) Limited, Brisbane—	
Bio Gastric Distemper Mixture	1437
Bio Worm Powders for Horses	2452
Denhams Proprietary Limited, Brisbane—	
"Poultry's" Chicken Pox Preventative	427
Goldsbrough Mort & Co. Ltd., Brisbane—	
Wurm-Ez-Ol Sheep Drench	1062
Carbene Sheep Drench	1063
Cee-Tee-Cee Sheep Drench	1064
To-Cu-Sul Sheep Drench	1719
Too-Partz Double Strength Sheep Drench	2132
McDonald and Company, A. H., Brisbane—	
Vetamac Medication	2501
Vetamac Pink Eye Powder	2723
Nobles Proprietary Limited, Brisbane—	
Sykes's Abortex	1084
Osmond and Sons (Australia) Proprietary Limited, South Brsbane—	
Osmond's Antiseptic Pessaries	134
Osmond's Aphrodisiac Powders	1918
Osmond's Bot Capsules	210
Osmond's Chlorosyl	2167
Osmond's Compound Santonin Worm Powders for Pigs	1477
Osmond's Foot-Rot Paste	1074
Osmond's Grease Wash	2168
Osmond's Improved Blister	477
Osmond's Saltona Blood Salt	330
Osmond's Special Scour Cordial	481
Osmond's Special Worm Drink for Horses	482
Parke Davis and Company, Brsbane—	
Bio 882 Blackleg Aggressin	2601
Salmond and Spraggon (Australia) Proprietary Limited, Brisbane—	
Bob Martin's Cat Powders—Tasteless	2611
Bob Martin's Worm Capsules	2613
Spedosol Supply Company, Brisbane—	
Spedosol Powder	26
Stimson, J. L., Coolangatta—	
Stimson's "Eezoil" Mange Mixture	2685
Taylors Elliotts and Australan Drug Proprietary Limited, Brisbane—	
Cylol	1977A
Doyle's Distemper Mixture	167
King's Greyhound Tonic	2172
King's Pad Paint	2173
King's Worm Capsules	2171

Vitaforce Products (Queensland), Brisbane—

Vitaforce Distemper Capsules	2557
Vitaforce Dog Soap	2556
Vitaforce Greyhound Tonic	2561A
Vitaforce Puppy Worm Syrup	2559
Vitaforce Worm Capsules	2560

INDEX OF BRANDS

that are not indicated in the foregoing list by the Primary Dealers name:—

Brand.	Primary Dealer.
Bio	Buzacotts (Qld.) Ltd.
Bio	Parke Davis & Co.
Bob Martin's	Salmond & Spraggon (Aust.) Pty. Ltd.
Doyle's	Taylors Elliotts & Australian Drug Pty. Ltd.
King's	Taylors Elliotts & Australian Drug Pty. Ltd.
Poultry's	Denhams Pty. Ltd.
Sykes's	Nobles Pty. Ltd.
Vetamac	McDonald & Co., A. H.

CARE OF THE DIP.

Cattle owners in ticky country often neglect their dipping vats. Consequently, they lose money without realising it, for cattle dipped recently in a dirty vat lose their bright, clean appearance, which helps the seller when the bidding in the sale ring is brisk.

In the course of time, a dipping vat will accumulate a considerable quantity of filth which settles slowly on the bottom as a deposit of sludge. It may become so bad that an owner is forced to empty the vat, and is then put to the expense of recharging.

This can be avoided by cleaning the vat periodically. For this purpose, a kerosene tin is cut in half diagonally to make a scoop, which is attached to a handle with wire. Small holes are cut in the bottom and sides. After dipping cattle, the surface of the fluid may be skimmed with the scoop and floating hair and dirt removed. This helps to keep the vat clean for a long time.

After dipping, the sump should also be cleaned and dirt prevented from accumulating.

A white mark should be placed on the side of the vat to show the height of the fluid. It will be noticed, particularly in hot weather, that evaporation is very rapid, and the surface of the fluid will fall far below this mark. Before next dipping, water may be added until the dipping fluid is again at the correct level. It is only the water that evaporates—not the concentrates.

General Notes

Staff Changes and Appointments.

The transfer of Mr. A. F. Moodie, inspector of dairies, from Mackay to Hughenden, has been cancelled, and Inspector G. K. L. Clark, Murarrie, will be attached to Hughenden.

Mr. J. Davies, inspector of dairies, Gayndah, will be transferred to Ipswich.

Mr. W. Grimes, care of the Fairymead Sugar Co. Ltd., Bundaberg, has been appointed millowners' representative on the Fairymead Local Sugar Cane Prices Board, vice Mr. T. W. Pulsford, resigned.

Constable E. F. P. Duncan (South Kolan) has been appointed also an inspector under *The Slaughtering Act*, and Constable W. M. McNaught (Mackinlay) has been given the additional appointment of inspector under *The Brands Acts.*

Messrs. G. A. Zahmel (Finch Hatton) and L. A. M. Patterson (Silkwood East) have been appointed honorary protectors under *The Fauna Protection Act.*

The following additional assistant cane testers have been appointed for the present sugar season at the mills indicated:—

Messrs. C. W. Miller (Cattle Creek), L. Hoffman (Isis Central), C. Eales (North Eton), H. B. Beaman (Mulgrave), J. J. Devlin (Mount Bauple), and B. N. Stuart (Qunaba).

Misses J. Ker (Racecourse), T. H. Shield (Gin Gin), F. M. Wilson (Maryborough), L. Oakes (Invicta), and D. M. Mittelheuser (Bingera).

Transfers of cane testers and assistant cane testers:—

Mr. L. J. G. Becker has been transferred from Plane Creek to Pleystowe as cane tester.

Mr. H. C. Jorgensen has been transferred from Pleystowe to Plane Creek as cane tester.

Assistant cane testers:—

Mr. R. Anderson from Kalamia to Fairymead.
Mr. L. C. J. Clifton from Fairymead to Kalamia.
Mr. W. C. Cocking from Qunaba to Proserpine.
Miss F. Foubister from Racecourse to Pleystowe.
Mr. H. J. Heidke from Proserpine to Qunaba.

Mr. G. E. Rogers, inspector of slaughterhouses, is to be retired from the Public Service as from 31st December, 1940.

The following police officers have been appointed inspectors under *The Brands Acts*:—

Sergeant N. Munckton, of Lowood.
Constable T. A. McNaught, of Kajabbi.
Constable E. W. Bateson, of Dobbyn.
Constable W. F. Aplin, of Urandangie.
Constable J. P. Wilkinson, of Burketown.

Mr. L. E. F. Walter, temporary inspector under *The Diseases in Stock Acts*, Department of Agriculture and Stock, has been transferred from Normanton to Kajabbi.

Constable F. L. C. Golledge, Yuleba, has been appointed also an inspector under *The Slaughtering Act.*

Miss M. A. Morris, cane tester, has been transferred from Cattle Creek mill to Marian mill.

Mr. D. Walton, assistant cane tester, Pioneer mill, has been appointed cane tester at the Cattle Creek mill.

Miss P. K. O'Mara has been appointed an assistant cane tester at the North Eton mill, and Messrs. H. R. Dark and L. Kelso have been similarly appointed to the Pioneer and Mulgrave mills, respectively.

Mr. F. B. Coleman, Officer in Charge of the Seeds, Fertilizers, &c., Branch of the Department of Agriculture and Stock, has been appointed also Principal Officer in Charge, Officer in Charge, and Inspector under "*The Agricultural Requirements Control and Conservation Act of* 1939." Under the same legislation, Mr. R. A. Taylor, Inspector and Examiner, has been appointed Principal Officer in Charge and Officer in Charge at any time during the absence of Mr. Coleman, and also an Inspector. Messrs. F. P. C. Bell and R. J. Holdsworth, Inspectors under *The Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Acts*, and A. C. Peel, Acting Inspector under those Acts, have been appointed Inspectors.

Constable T. Cavanagh, Yelarbon, has been appointed also an inspector under *The Slaughtering Act.*

Mr. D. R. L. Steindl, assistant pathologist, Bureau of Sugar Experiment Stations, has been transferred from Brisbane to Bundaberg.

Messrs. F. W. Blake, P. M. O'Connor, M. J. Waddell, and C. R. M. Clelland, Clerks of Petty Sessions at Babinda, Gordonvale, Tully, and Gin Gin, respectively, and chairmen of the Babinda, Mulgrave, Tully, and Gin Gin Local Sugar Cane Prices Boards, respectively, have been appointed also agents of the Central Sugar Cane Prices Board for the purpose of making enquiries under *The Regulation of Sugar Cane Prices Acts* in respect of sales and leases of assigned lands.

Messrs. W. L. B. Morgan, Mount Pleasant, Dayboro'; A. Morton, manager, Dynevor Downs, Eulo; and G. Ahern, Lakeview, Goomeri, have been appointed honorary protectors under *The Fauna Protection Act.*

Mr. J. W. Black, Pioneer sugar mill, Pioneer, via Townsville, has been appointed millowners' representative on the Pioneer local sugar cane prices board.

Mr. A. M. Taylor, Police Magistrate, Ayr, has been appointed chairman of the Invicta, Kalamia, Pioneer, and Inkerman local sugar cane prices boards and an agent of the Central Sugar Cane Prices Board, in place of Mr. T. E. Dwyer, transferred.

Mr. T. E. Dwyer, Police Magistrate, Ingham, has been appointed chairman of the Victoria and Macknade local sugar cane prices boards and an agent of the Central Sugar Cane Prices Board, in place of Mr. A. E. George, transferred.

Messrs. B. J. Bourke, N. Courtice, and D. James, inspectors for the Bundaberg Cane Disease Control Board, have been appointed temporary inspectors under "*The Diseases in Plants Acts,* 1929 *to* 1937."

Miss F. Atherton and Mr. J. H. Murtagh, assistant cane testers, have been transferred from Moreton to South Johnstone and from South Johnstone to Moreton, respectively.

Constable F. T. W. Crawshaw, Hebel, has been appointed also an inspector under *The Slaughtering Act.*

Mr. J. M. Kennedy, health inspector, Innisfail, has been appointed also an honorary protector under *The Fauna Protection Act.*

Banana Industry Protection Board.

An Order in Council has been issued under *The Banana Industry Protection Acts* providing for a levy on banana-growers to be used for the maintenance of the Banana Industry Protection Board. The levy, the same as that approved last year, is at the rate of 1½d. a case for bananas marketed in the case, or 2d. in the £1 or part thereof for bananas marketed in the bunch.

Wild Life Preservation.

Under "*The Fauna Protection Act of* 1937" two new sanctuaries have been declared:—

1. The property held by Mr. Charles E. Nason of Surat.
2. Lamberts Beach and Amhurst Township.

The Fertilisers Act.

An amendment of Regulations under "*The Fertilisers Act of* 1935" approved recently relates to the method of declaring magnesia (MgO) on labels of fertilizers and/or lime for agricultural purposes, and the provision of a standard for dolomite and/or lime for agricultural purposes containing magnesia (MgO).

Mr. L. D. Carey has been appointed Chief Inspector of Stock in succession to the late Lieut.-Colonel A. H. Cory, M.R.C.V.S. Mr. Carey was born and educated on the Darling Downs, and joined the field staff of the Department of Agriculture and Stock as Inspector of Stock in 1918. In 1920 he was promoted District Inspector and in that capacity served in the North, North-West, Central, Central-West, and Toowoomba stock divisions of the State. In 1934 he was appointed to the newly established position of Staff Inspector. Mr. Carey is keenly interested in country show societies and has acted as a stock judge on many occasions.

Plate 38.
Mr. L. D. Carey.

Mr. H. A. Iliff, Senior Clerk, Stock Department, who has been appointed Registrar of Brands in succession to the late Lieut.-Colonel A. H. Cory, M.R.C.V.S., has had long and meritorious service in the Department of Agriculture and Stock. He was appointed Deputy Registrar of Brands in 1916, and was associated closely with Colonel Cory in the administration of the veterinary and correlated services of the Department since 1925. When legislation to provide for the registration of veterinary surgeons in Queensland was passed in 1936, Mr. Iliff was appointed Registrar of the Veterinary Surgeons Board, a position which he retains in addition to his new appointment.

Plate 39.
Mr. H. A. Iliff.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Sida Retusa.

A.J.B. (Ipswich)—

1. *Sida retusa* is widely spread over the warm regions of the world. It is a native of Asia. It was collected in Australia many years ago, and there is just a chance that it is also a native here. It was supposed to be naturalised in New South Wales from Mauritius.
2. It is a valuable fibre plant. It also is quite a useful fodder and in New South Wales is frequently known as "Paddy's Lucerne."
3. It thrives best in the sub-tropical parts of the State, on the coast and near-coast, and does particularly well on alluvial flats or country suitable for cultivation. It does not seem to occur to a great extent in the near tropical parts of Queensland, where it is replaced by an allied species, *Sida acuta*.

"Wild Sunflower"—A Poisonous Weed.

E.M. (Roma)—

The specimens represent *Verbesina encelioides*, a native of North America, now a very common naturalised weed in Queensland. It is usually popularly known as wild sunflower. In recent years it has spread to an alarming extent in parts of the Darling Downs and Maranoa districts. It has been proved poisonous to sheep, but they do not usually eat it in sufficient quantities to cause trouble. Losses, however, now and then do occur. The plant should be controllable by spraying, particularly with arsenical sprays, but there is always risk in using these where stock are running.

Green Panic. "Smother Grass."

M.R.M. (Mundubbera)—

1. *Panicum maximum* var. *trichoglume*, known as Green Panic or Slender Guinea Grass. A short note on this grass was in this Journal for February, 1938, under the heading "The Varieties of Guinea Grass Cultivated in Queensland."
2. *Dactyloctenium* sp., often called "Smother Grass." In Africa it is known as *Dactyloctenium mucronatum*. This species belongs to the same genus as the common Button Grass of Western Queensland. It is at present sparsely scattered throughout the subtropical seaboard. Little is known about its use as a fodder species, except that cattle seem to like it, and also it is an aggressive grower and spreads fairly rapidly. It has been used as a lawn grass in the Brisbane Botanic Gardens, particularly for covering the bare ground under trees and similar places where other grasses will not thrive.

Mat Grass.

F.A.T. (Murgon)—

As far as can be seen from your specimen, the grass is *Hemarthria compressa*, often called Mat Grass. In the absence of seed heads, however, it is difficult to be sure of the determination. The seed heads of Mat Grass are rather difficult to see. They appear as extensions of the stem projecting above the uppermost leaves, with the seeds very closely appressed and a little over ¼ inch long, the whole forming a cylindrical spike, about 3 inches in length.

As you mention, the grass is restricted to creek banks and low-lying areas with a moist soil. It is generally regarded as of moderate fodder value, and is a useful fattening grass. However, it would not be advisable to allow it to enter your cultivation if on low-lying land subject to flooding.

Blackleg.

C.W. (Gatton)—

The lesion described is an unusual manifestation somewhat rarely observed in cases of blackleg.

"Bullamon Lucerne."

E.H.A. (Mitchell)—

"Bullamon Lucerne" has been identified as *Psoralea eriantha*, a native legume with a fairly wide distribution in Western Queensland and New South Wales. It was originally collected in the neighbourhood of St. George by Sir Thomas Mitchell.

Blue Panic Grass. Purple Chloris.

"Sap" (Townsville)—

1. *Panicum antidotale*, Blue Panic Grass. This grass has attracted considerable attention in recent years, and seems to have good possibilities as a fodder. We should say a small plot of it would be valuable for periodical cutting or feeding-off. It may also be worth trying in fresh burns in the same way as Rhodes Grass.
2. *Chloris barbata*, Purple Chloris, also known as Wild Rhodes or Purple Rhodes Grass. It is closely allied to Rhodes, but has nothing like the same fodder value. It is quite a good grass in the young stages, but in the seeding stage becomes dry and innutritious.

A Common Weed in North Queensland Pastures.

M.McC. (Proserpine)—

The specimen is *Herpestis chamaedryoides*, a small plant which has become a fairly common weed in North Queensland pastures. It is not known to possess any poisonous or harmful properties, and apparently is of no value as a fodder, at least to any extent. No particular treatment of this weed is recommended, but it may be smothered with a creeping grass. Para Grass (*Brachiaria mutica*), better known in Queensland as *Panicum muticum* or Giant Couch, should be suitable. If the land is of only second-class value, Buffalo Couch or Broad-leaved Carpet Grass (*Axonopus compressus*) would be as good as any. This latter species is not regarded as a particularly valuable fodder, but is quite a good grass for second-class country.

Red Ash.

J.W. (Kingaroy)—

The specimen is the Red Ash (*Alphitonia excelsa*). This plant is generally regarded as an excellent fodder for stock, and our experience has been that horses and cattle eat it greedily. We have been told by an experienced pastoralist in the Brisbane Valley that his stock would not eat it in a dry time, although they seemed to eat it freely along with grass in an ordinary season. Another pastoralist has informed us that stock would not eat it when the plant was in berry. It is known by various local names, such as White Myrtle, Silver Ash, White Ash, and other local names.

Zamia.—Seeds Poisonous to Stock.

F.C.H. (Bald Mountain)—

The specimen is a cycad, *Macrozamia Paulo-Gulielmi*. The specific name "Paulo-Gulielmi" is Latin for Paul William. The plant was named by a German botanist after Prince Paul William, of Wurtenburg. It is commonly known as Wild Pineapple or Burrawong, also Zamia. Species of Zamia are known to cause rickets in stock. The seeds are poisonous, and some years ago serious losses occurred among a mob of travelling sheep eating the seeds of a species allied to yours, *M. spiralis*, of New South Wales.

Seeds of some of our Cycads were ground, made into flour, and used as food by the aborigines. The flour was placed in running water and afterwards cooked. Heat seems to dispel the poison. The poisonous principle has not been isolated.

Creeping Saltbush.

F.L. (Gogango)—

The specimen is of Creeping Saltbush (*Atriplex semibaccata*), a fairly common plant in many parts of Queensland, and generally regarded as a good fodder, although stock sometimes have to get used to the taste of the plant before eating it in any quantity. They seem to prefer it when it is dying off rather than when it is green and luxuriant.

Rural Topics

A Travelling Rabbit Freezer.

Although rabbits are not a very serious pest in Queensland, this item will interest many Downs farmers and landowners along the Border—A portable rabbit chilling plant has been established in the rabbit country of the Flinders Ranges, South Australia, consisting of a large motor-truck with a huge trailer which houses all the freezing machinery and the chilling room, including an engine to drive the compressor. The plant is capable of treating 6,000 rabbits every twenty-four hours; the chilled rabbits are transported to market in motor lorries and arrive in good condition. This is said to be the first mobile chilling plant to operate in Australia.

Money in the Bag.

"Save your sacks! Handle them with care!" That's the message being impressed on New Zealand farmers to-day, and for Queensland farmers it should have the same appeal. In the past many sacks, when emptied, have been left lying around to rot, or become useless otherwise. Only a small proportion of the bags went back into commercial use. Now, as a result of the war, sacks are saleable. One New Zealand farmer who looked after his sacks carefully, recently netted £120 for the stack of bags he had saved. When handled and stored carefully, heavy jute sacks have been known to be refilled with fertilizer as often as ten times, and those of lighter hessian material up to six times. "Waste not, want not," applies to empty bags in terms of real money to-day.

Give "Denis" His Due.

More than any other animal, the pig depends on his owner for the conditions under which he has to live. Dirt is not his own responsibility, because it will be many years before we can breed a race of pigs capable of cleaning out their own sties and then taking a shower bath without assistance.

"All Flesh is Grass."

Grass is man's most important item of diet. Of course, we don't browse with the cows, but we eat bread which is made from wheat and which is a grass; we eat sugar which is made from cane which is another grass; and we eat a thousand and one other foods made from grains which are grass. What grass we don't eat first-hand, we eat second-hand—in the form of eggs and bacon, roast lamb, and other meats. Yes, "all flesh *is* grass."

A New Angle on Farmers' Problems.

Do farmers regard some of their problems as trials or troubles instead of recognising that these problems are really interesting studies? This was how it was put by a man who has ploughed many a furrow on a prosperous property, as reported in *The New Zealand Farmer Weekly*—"We hear a great deal," he said, "of the 'problems' of the breeder, and of his difficulties in solving many questions of breeding, feeding, financing, and marketing, but, generally, I am inclined to believe that we have not been using the right word. 'Problems' in this case is a misnomer, and is a bit misleading. True enough, the breeder who desires really to succeed, to produce good cattle, to improve his herd, and to profit financially, does have a lot of questions that must be answered correctly, but these things are not really problems in the sense that they are trials or troubles. Rather, can't we look upon them as interesting studies, in whose correct solution we can find pleasure and enjoyment? The dictionary says that a problem is 'a question proposed for solution; a matter stated for examination or proof; hence a matter difficult of solution or settlement.' But it doesn't treat the 'problem' as a question of trouble or tribulation—a sense in which it is frequently regarded. Some people thrive, mentally, on 'problems' which, to others, are simply tiresome. The breeder who can bring to his aid a real enjoyment for the study and mental activity necessary in successfully solving his 'problems' will find their solution very much easier, and will come to regard them not as trials or difficulties, but more as opportunities for the exercise of his mental equipment. There is more fun to be got out of the achievement itself, very often, than the profits of the achievement."

When you come to think it out, those ideas seem to be based on sound farm philosophy.

Progress in the Pig Industry.

Pig raising is becoming, under the influence of war time economic conditions, more of a specialised industry rather than remaining a sideline to dairying and other kinds of farming. Judging by the increase of interest in the industry, the pig will soon occupy a more important place in Australian rural enterprise than it has ever held before.

The standard of breeding, too, is decidedly on the up grade and breeders in many districts are concentrating with the utmost keenness on the preparation of animals for this year's district shows.

This show business is no pastime, but all the hard work and care associated with it are well worth while, for it gives the breeder an opportunity to "show the world" in the most direct and practical way what he is doing—in other words, to display his ideas of what a pig should be as exhibited in the show pen. A good show pig tells a story of sound judgment and competent care more convincingly than all the talk on the top rail.

A breeder should welcome every opportunity of showing his stock. If they are top-notchers they are bound to create interest among prospective buyers. If they do not measure quite up to the winning standard, the breeder gets the best of lessons by comparison and so improves on his exhibits for the next district show.

Producer Gas Units.

Interest in the possibilities of producer gas is growing remarkably.

The Government is taking a keen interest in its possibilities and has now formed an investigational and advisory committee to examine the engineering and economic espects of charcoal gas production. Consequently, the best possible advice on developments in gas production will be available to farmers and everyone else who is interested in cheaper fuel, especially as a war time economy.

Already considerable progress has been made in experimental work in the use of producer gas and the production of charcoal. The Forestry Sub-Department is now busy on a plan involving the using of waste timber from Crown lands near Beerwah in its conversion into charcoal, and the replanting of the area with more useful trees. Money has been made available for the purchase of producer gas equipment for use under service conditions and for the careful checking of its performance.

Sweet Corn for Planting—A New Industry in the South.

Sweet corn as a new industry is making considerable progress in the Hawkesbury River District in New South Wales. Yields up to 4 tons to the acre are expected under irrigation. During the past two years attempts have been made to establish a corn-canning industry, and although the seasons have been the worst for ten years in the areas of supply, results have been very gratifying.

Increased yields are anticipated from late sowings which have been irrigated. Only the golden coloured varieties of sweet corn are favoured for canning. There are many other districts in the South where the corn will grow well, but nearness to a cannery is essential, as the corn must be processed as soon as possible after it is pulled.

It would be interesting to find out if there is any future for such an industry in Queensland, for new industries are always welcome if it is possible to establish them on an economic basis.

Where the Branding Iron Should be Placed.

More attention is now being given to the proper branding of cattle, and that means that we are well on the way towards preventing the enormous loss—said to run into hundreds of thousands of pounds a year—caused by faulty branding, branding on the rump and other valuable parts of the hide, and the use of unnecessarily large brands.

At a time like this when we are out to eliminate every form of unnecessary waste, it goes without saying that the benefit of correct branding of cattle will not lack appreciation by the stockowner. Correct branding cuts out a big percentage of waste leather in the tanned hide and increases the value of Australian hides and leather, which are among our exports which are growing rapidly in importance.

In New Zealand, the Argentine, and the United States, branding, if not completely abolished, is limited to sections of the hide less valuable than the rump.

Farm Notes

SEPTEMBER.

WITH the coming of warmer weather, weeds of all kinds will be making their appearance on cultivated land and among row crops, but in the latter case they can be effectively dealt with by inter-row cultivation, and, where necessary, by the use of the hoe.

Where crops are sown on thoroughly fallowed land, the greater freedom from weed infestation is at once apparent when compared with adjacent paddocks which have merely received a hurried preparation, so that sowing clean seed on clean land may be amply rewarded in the resultant clean crops and higher returns.

Potatoes planted during July and August should now be making growth, and should be sprayed with Bordeaux mixture as a preventive of blight, particularly if cool, moist weather is experienced. Bordeaux and Burgundy mixtures are not regarded as a cure for blight, but the spray forms a satisfactory protective covering, which, if applied at intervals during growth, will effectively prevent the disease. Where land has received adequate preparation, forming a satisfactory seed-bed, and has a sufficiency of subsurface moisture to induce germination, early sowings of maize, sorghum, sudan grass, millets, cowpeas, and pumpkins and the planting of sweet potato cuttings may be proceeded with, the farmer's chief concern being to provide a sufficiency of summer-growing fodder and grain crops both for current needs and for storage as seasonal reserves.

The spring maize crop is usually considered as uncertain for grain production, as the warm, moist conditions required during the tasselling period do not always occur, but as excellent crops are sometimes obtained the risk is well worth while, especially as the fodder provided can always be put to good use in the event of a failure for grain.

Early-maturing Yellow Dent varieties—such as Funk's 90-Day—will be found the best for early sowing, as they have the capacity of making the best use of available moisture.

Market prices also are a consideration, for although early sown maize is usually intended for farm use, any surplus can be disposed of at higher prices than may be obtainable for the main crop at a later date.

Sweet potato cuttings will now be obtainable, and attention is directed to this valuable crop, which will thrive over a much greater range of climatic and soil conditions than the English potato. There is scarcely a farm throughout the State which would not benefit from a patch of sweet potatoes, for either culinary use or stock-feeding. They are not always profitable as a market consideration, but improvement in this direction is possible if well-graded tubers of suitable cooking varieties only are offered.

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PLAYING POLO WITH A HOE.

In the Forbes district (New South Wales), where polo is the most popular game with the ''young bloods,'' the local sports exercise their polo ponies in a game of burr cutting, using a long-handled hoe as a stick and undercutting the objectionable growths neatly instead of hitting a ball. It seems a peculiar way of weeding, but where the burrs are scattered, the young polo players at least make an interesting job out of what ordinarily is an arduous task, and, at the same time, judging by the scores put up, keep their eye in very effectively for the district polo matches.

Seriously, however, the scheme has much to commend it, as a horseman can see the weeds much more easily than a man on the ground, and there is never any need to dismount to cut the burrs out, as the job can be done easier with one swish of a sharp, narrow-bladed hoe.

Orchard Notes

SEPTEMBER.

THE COASTAL DISTRICTS.

IN the North Coast and Gayndah districts most of the citrus crops have been harvested, with, perhaps, the exception of Valencia Lates. Orchard work this month includes pruning, cultivation, fertilizing, and spraying. Some trees may be showing signs of impaired vigour, and these will require a severe pruning, both in thinning and shortening back, removing superfluous growths and diseased and weakly woods. Healthy and vigorous orange trees will require little attention beyond the removal of crowded lateral growths.

Mandarins will need special treatment, particularly Glen Retreats and Scarlets. These varieties usually produce a profusion of branches, and as the trees mature the growths harden and the fruit-bearing shoots make short, weakly growths, which usually result in an over-production of small fruits and a weakening of the trees. This is noticeable particularly in the case of the former variety, for which the annual pruning should consist of a heavy thinning and shortening back. Mature mandarin trees require attention towards assisting them to produce new and vigorous fruit-bearing growths.

Unprofitable trees should receive attention and be prepared for top-working. They may be headed back to three or four main arms radiating from the stem and whitewashed to prevent bark scald. Such trees may be grafted or later budded when suitable growths have matured.

Before working up the soil, fertilizing should receive attention. The spring application should carry a high percentage of nitrogen.

In the warmer districts, which are free from frosts, plantings of young trees may be made. Serious consideration should be given only to the selection of commercial varieties and, having due regard for local conditions, selections may be made from the following varieties:—Washington, Navel, Joppa, Siletta, Valencia Late, Beauty of Glen Retreat, Emperor, Scarlet, Solid Scarlet, Marsh Seedless or Thompson grapefruit, and Villa Franca, Lisbon, and Genoa lemons.

Where melanose and black spot are present in orchards, preparations for control measures should be made and Bordeaux sprays applied at the correct times.

Most citrus trees would benefit considerably by the application of a strong lime-sulphur wash, 1-18.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

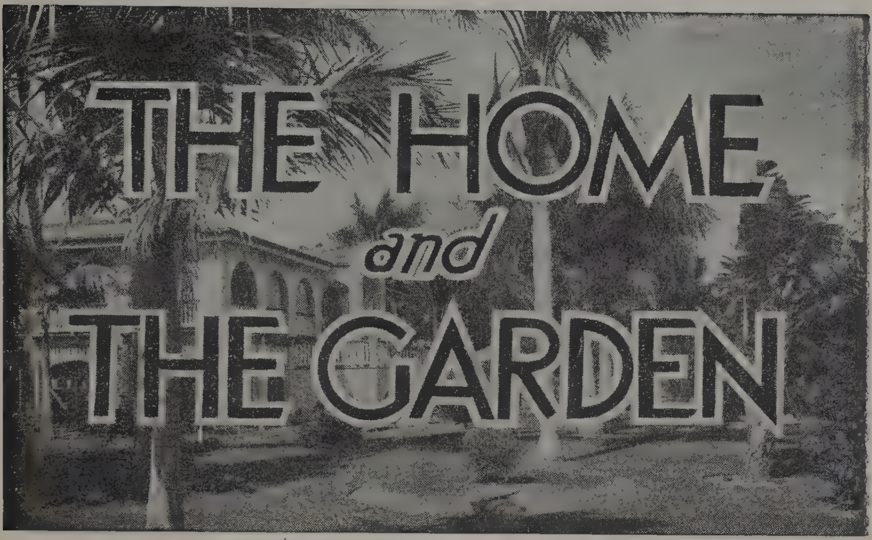
BLACK aphis should be attacked wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty. If these very destructive insects are kept well under control, the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working-over of undesirable varieties of fruit trees may be continued. The pruning of grape vines should be done during this month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture, but also act as a harbourage for many serious pests, such as the Rutherglen bug.

New vineyards may be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer localities suitable for the growth of citrus fruits, the land should be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

Fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this swarm of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

CLOTHES AND SHOES FOR THE OLDER CHILD.

(Continued.)

LAST month we talked about children's clothing generally and gave an outline of suitable clothing for little girls. This month we are going to complete our suggestions in regard to clothing and also give some good advice about a much-neglected subject—care of the feet.

Knickers for Little Boys.

Material.—In cold weather, little boys may need knickers made from warmer materials than those we use for girls, as they have no covering skirt. Woollen materials that are warm, light, porous, and easily washed and brushed are recommended. If linings are used they should be of light weight cotton material, not heavy calico. Unlined knickers worn with underpants made of cellular cotton are practical and hygienic. Backs of knickers should be cut longer and slightly wider than fronts to allow ample room for bending and sitting, and there must be plenty of length from waist to fork. The seams of boys' knickers should be strongly machine sown. Knickers should be worn outside a shirt waist and attached to it by buttons, or they may hang from wide braces of their own material crossed at the back to prevent slipping on the shoulders.

Rompers and crawlers are very useful. They should be made very loose so as not to hinder the child's play, and it is a good plan to make them of gay material so as to develop the child's growing sense of pattern and colour. They should, of course, be washable.

Young children may be allowed to play in gardens and on the beach in sun suits when the weather is warm. Artificial silk or cellular cottons are the best materials for sun suits, which should take the form of tiny shorts with criss-cross shoulder straps. Care must be taken in our hot Queensland summer that the skin is exposed to the sun very gradually and to begin with at a time when burning is not likely to occur, say, in the early morning. The aim should be to secure a tanned effect. And while on this subject it may be opportune to condemn the practice which is followed by some mothers of dressing tiny boys in long trousers and heavy double-breasted coats. Apart from the fact that these garments completely destroy the attractive naturalness of the unfortunate child, they inevitably limit the child's movements and prevent the health-giving rays of the sun from getting to his legs and arms and helping to make them strong and straight.

Footwear and Care of the Feet.

Next time you sit on the beach watching the crowds go down to bathe, I suggest that you might learn a valuable lesson by watching, not the pattern and colour of the swim suits, but the shape of the feet of the people who pass you by. What a sorry sight most of them are, especially the women's feet, with their distorted and misshapen joints telling the story of unnecessary suffering caused by the neglect or ignorance of the parents or others who cared for these people in their childhood. The feet are the most complicated structure in the human body. They are built up of twenty-six bones, which form a series of arches with weight-bearing points, and they have to support, not only the weight of the body, but whatever load may be added to it. It is fairly safe to say that although some foot deformities are the result of illness, improper feeding, or too rapid increase in weight, the great majority are caused by ill-fitting shoes. Now that we have faced this position, let us see what you, who are now the parents of young children, can do to care for their feet, so that they can walk with ease and grace and have feet that are as attractive in shape when they grow up as they are now. Consider the case of a baby of twelve months of age. He has probably worn until now soft shoes and socks that permitted the natural development of the feet, and we are now going to buy the first pair of toddling shoes—something to wear while he is learning to walk, although he will accomplish this better with bare feet on the veranda or smooth lawn. The average year-old baby will need size 3 or 4 in shoes, and they should have a pliable leather sole. Welted shoes are the best when baby is older and walking well, but are rather cumbersome for first shoes. When fitting the shoes on allow baby to stand in them and see that there is about a quarter of an inch to spare beyond the limit of the great toe. This is very necessary because of the very rapid growth of the little feet. Do not buy more than one pair of shoes, as baby will grow out of them in a few months.

At the age of sixteen to eighteen months baby will probably have outgrown his first pair of shoes, and now you can buy welted soles, provided they are pliable as well as firm. Again take the precaution to allow him to stand up in his shoes and see that there is growing room, and never allow him to wear them once the great toe is jammed hard into the toe of the shoe. It is better that a child should go bare foot than that he should be made to go about in shoes too short for him just because they are not worn out. As little boy or girl grows older, always keep watch on the following points when buying shoes:—

(1) That the shoes shall be made to fit the foot and not the foot to fit the shoe.

(2) The heels shall be broad and from ½ to 1 inch high.

(3) Toes should be square, or at least well rounded.

(4) Welted soles—never pump soles, except for party wear.

Teach children little exercises for strengthening the feet, and teach them to be proud of keeping them in good shape, and so protect the rising generation from the "physical vice of deformed feet."

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N.1, Brisbane.

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IN THE FARM KITCHEN.

JAM AND CHUTNEY.

If summer fruits are best for bottling and preserving, winter fruits are excellent for jams and chutneys. Oranges and apples can be utilised in dozens of ways, and here are some suggestions:—

Mixed Marmalade.

This is a special recipe and is well worth trying. Wash well 2 grapefruit, 4 sour apples, 4 lemons, 4 nice navel oranges. Peel very thinly and shred very finely. Place in preserving pan. Squeeze juice from fruit and add to shredded rinds. Peel and core the apples and place the cores and skins with the piths cut up small into a piece of muslin and tie up loosely. Chop the apples and add them to the juice, &c. Add 8 pints water and boil all together until shreds are tender and the contents reduced quite a lot. Remove muslin and press moisture out, leaving the muslin bag as dry as possible. Now add 6 lb. warm sugar, bring to boiling point, and boil quickly for about 20 minutes, or until it jells when tried on a cold plate. Sometimes this mixture will jell after 10 minutes of quick boiling. Seal in the usual way.

Apple Chutney.

Peel 6 lb. sour apples and put them through a mincer with 6 medium-sized onions. Put in a saucepan with the grated rinds and juice of 4 lemons, 2 lb. seeded raisins, 3 lb. brown sugar, 3 finely-chopped cloves of garlic, 2 dessertspoons ground ginger, 2 tablespoons mustard seed, 1 teaspoon celery seed, pepper, salt, and 2 quarts malt vinegar. Bring to boil and simmer until tender, stirring well during the boiling, as it burns easily on account of being thick. Allow mixture to become quite cold before bottling. Seal with paraffin wax.

Pear Conserve.

Take 12 lb. pears (quartered), 9 lb. sugar, 3 pints of water, 1 tablespoonful of cloves, 1 teaspoonful citric acid. Boil sugar and water together for a quarter of an hour, add fruit, and boil till it turns red (four or five hours). The cloves must be tied in muslin and boiled with the pears. Add acid about twenty minutes before it is done. Will keep for years.

Apple Marmalade.

Take 4 lb. of apples, pare, core, and slice, and place in a pan with just sufficient water to barely cover them. Boil to a pulp and rub through a sieve. Allow 1 lb. of sugar to every pound of pulp, add a little cinnamon, and boil once more for about half an hour, stirring constantly. Put into jars and cover down as quickly as possible.

Orange and Lemon Marmalade.

Take 6 oranges and 6 lemons, cut up very fine, using all but the pips. To every cup of pulp add 3 cups of water and soak all night. Next day boil for a quarter of an hour and leave to soak another night; then add 3 parts of a cup of sugar to 1 cup of pulp, and boil till the right consistency.

Pear Marmalade.

Choose as many ripe, mellow pears as you desire to use. Weigh, pare, halve, and core, and put into a preserving pan. Cover with water and simmer gently till they are tender. Lift them out of the water and boil the liquid for an hour with the skins and cores of the pears. Strain the liquid, and make a syrup by boiling 1½ lb. sugar for every 2 lb. of fruit. Let this syrup boil till it will stiffen.

Apple and Marrow Chutney.

Peel, slice, and cut marrow into small pieces, and weigh 3 lb. Put into a large basin in layers, sprinkling each layer with a little salt. Allow to stand overnight, then the next day pour off the water. Peel and chop 3 lb. apples and place them in a saucepan with the prepared marrow, 1 lb. chopped onions, 1½ lb. brown sugar, 3½ pints malt vinegar, 1 lb. sultanas, ½ oz. salt. Place 2 cloves garlic, ½ oz. mustard seed, 1 oz. whole ginger, 1 oz. peppercorns, ¼ oz. pimento, and a few cloves, if liked, in a muslin bag and tie loosely. Bring to boiling point and simmer gently until tender and rather thick. Remove bag, and bottle.

Grapefruit and Apple Jelly.

Wash 2 grapefruit and 2 lemons, also 1 lb. sour apples. Peel the grapefruit and lemons very thinly and shred finely. Peel and core apples and cut into slices. Squeeze the juice from the fruit and place in a boiling pan with the sliced apples. Tie the apple skins in a piece of muslin with the pith and pips. Add 2 quarts of water and bring to boiling point. Simmer for 1½ hours, taking care the apples are well mashed. By this time the contents of pan should be reduced quite well. Strain through a clean tea towel and allow to drip without squeezing. When liquid is all drained from the towel, replace pulp back in saucepan, cover with cold water, and boil gently for another hour. Strain through the towel again, and when all juice is extracted mix the two together. Now weigh syrup and place in large pan; add equal weight of warm sugar, bring to boiling point, and boil quickly for about 20 minutes, or until it jells when tested on a cold plate. Pour into warmed jars and seal immediately with liquid paraffin wax.

Apple and Pear Chutney.

Peel apples and weigh 4 lb., also 2 lb. pears, after peeling. Put them through the mincer with 1 lb. onions, 2 lb. seeded raisins, 2 cloves garlic, ½ lb. preserved ginger, and 1 red and 1 green capsicum. Put all this in a saucepan and add 2 lb. dark-brown sugar, 4 oz. salt, 1 tablespoon mixed spice, ¼ oz. ground chillies, 1 pint vinegar. Cook very slowly, stirring constantly, as this chutney burns very easily. Cook for one hour, adding a little more vinegar if too thick. Bottle and seal when quite cold.

Apple and Ginger Marmalade.

Wash 6 lb. sour apples well and cut into thin slices without peeling. Place in a large pan with 3 pints of water and the juice of 2 lemons. Boil until tender and well mashed. Strain through a clean towel and allow liquid to drip out without squeezing. When liquid is all dripped out, add another pint water to pulp and boil for another hour. Strain this through the towel, then mix the two syrups together. Weigh syrup and add equal weight of warm sugar. Add 2 lb. preserved ginger cut into small pieces. Boil quickly for 10 minutes, then bottle in the usual way.

FOR LUNCH.

Corned Beef Stew.

Melt 2 level tablespoons butter or margarine in a saucepan, add 2 finely-chopped large onions and fry until light-brown. Add 2 cups diced beef, 6 peeled and halved tomatoes, 2 cups cooked haricot beans. Bring very slowly to boiling point, season with pepper and salt, and simmer very gently for 10 minutes. Make a border of mashed potato and fill centre with stew. Sprinkle with chopped parsley.

Cornmeal Pikelets.

Sift ½ cup self-raising flour, ½ cup cornmeal, pinch salt, and 2 tablespoons sugar into a basin; beat 1 egg well, add a little more than ½ cup milk. Pour into centre of flour and mix well together. Dissolve ¼ level teaspoon bicarbonate soda in about 1 tablespoon boiling water, add to batter with 1 dessertspoon melted butter. Beat well and bake in spoonfuls on a hot, greased girdle. Serve with honey or maple syrup.

Orange and Walnut Tart.

Beat the yolks of 3 eggs until very light; gradually add 1 level cup sugar and beat until very thick and almost white. Add 1 cup finely-chopped walnuts, ¼ cup sao biscuit crumbs (very fine), 2 tablespoons rice bubbles, grated rind of 2 oranges, ½ cup orange juice, and a pinch salt. Whip the whites to a very stiff froth and fold into the mixture. Bake in 2 well-greased and lightly-floured sandwich tins for about ½ hour. When cold, join together with an orange filling, made with ½ cup each orange juice, water, and sugar, and 1 tablespoon lemon juice. Bring to boiling point and add 1 level tablespoon cornflour diluted with a little cold water or orange juice. Stir until mixture is clear, then remove from fire and add 1 dessertspoon butter by degrees. Cool and use as directed. The tart may be spread with raspberry jam instead of filling. Sprinkle thickly with icing sugar.

Celery Fritters and Bacon.

Scrape celery well and cut into 3-inch pieces. Cook gently in salted water until tender; drain well, then dip in a good frying batter flavoured with curry-powder. Fry in boiling fat until a golden brown, drain, and serve with crisp bacon.

Medley Stew.

Fry 2 large minced onions in bacon fat until brown, add ½ lb. minced steak, free from fat, and stir all the time while cooking so as to keep particles of meat separate. Add 2 cups cooked spaghetti and 4 sliced and cooked tomatoes. Melt ¾ cup grated cheese in 1 medium-size tin tomato soup, add 1 tablespoon any good relish and a little clove of garlic (optional). Add soup, &c., to meat, stir until well blended, adding more salt and pepper if necessary. Serve piping hot with fingers of toast or fried bread.

Strawberry Shortcake.

Sift together 2 level cups flour, 4 level teaspoons baking powder, ½ level teaspoon salt, add 1 tablespoon castor sugar, rub in ⅓ cup butter with fingertips, then gradually add 1 egg, well beaten, mixed together with ⅓ cup milk. Toss mixture on to floured board and divide into two parts. Pat out to fit the size of a sandwich tin, brush over with melted butter, then place the other half on top. Bake in hot oven for about 15 minutes. When cooked, split with knife. Fill with strawberries, crushed a little, add sugar to taste and whipped cream. Place on the other half. Decorate with whipped cream and a few whole strawberries.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1940 AND 1939, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of years' re-cords.	June, 1940.	June, 1939.
North Coast.	In.		In.	In.
Atherton	1·70	39	3·72	3·63
Cairns	2·88	58	3·08	5·13
Cardwell	2·04	68	3·59	2·78
Cooktown ..	2·02	64	1·17	4·05
Herberton ..	1·18	54	1·75	3·54
Ingham	2·43	48	2·77	2·60
Innisfail	7·20	59	15·74	5·43
Mossman Mill ..	2·50	27	3·26	4·48
Townsville ..	1·55	23	0·49	1·76
Central Coast.				
Ayr	1·45	53	0·45	0·97
Bowen	1·63	69	0·24	1·70
Charters Towers ..	1·34	58	0·55	2·89
Mackay P.O. ..	2·74	69	0·75	3·55
Mackay Sugar Experiment Station	2·46	43	0·88	2·83
Proserpine ..	3·30	37	1·71	2·89
St. Lawrence ..	2·47	69	0·14	2·34
South Coast.				
Biggenden ..	2·24	41	0·19	3·64
Bundaberg ..	2·86	57	0·25	3·64
Brisbane	2·66	88	1·07	2·44
Caboolture ..	2·61	53	2·58	2·21
Childers	2·45	45	0·55	3·53
Crohamhurst ..	4·38	47	2·87	4·02
Esk	2·16	53	1·84	2·06
South Coast—contd.	In.		In.	In.
Gatton College ..	1·77	41	1·09	1·81
Gayndah	1·85	69	0·15	5·25
Gympie	2·63	70	1·13	2·42
Kilkivan	2·10	61	1·17	3·10
Maryborough ..	2·99	69	0·65	3·50
Nambour	3·71	44	3·24	4·13
Nanango	1·97	58	2·09	3·32
Rockhampton ..	2·56	69	..	2·67
Woodford ..	2·82	53	1·87	2·57
Central Highlands.				
Clermont ..	1·68	69	0·07	1·28
Gindie	1·43	41	..	0·87
Springsure ..	1·75	71	0·05	0·59
Darling Downs.				
Dalby	1·67	70	0·91	3·18
Emu Vale ..	1·49	44	0·41	2·76
Hermitage ..	1·67	33	..	..
Jimbour	1·62	52	1·24	2·39
Miles	1·74	55	..	2·11
Stanthorpe ..	1·88	67	1·03	2·33
Toowoomba ..	2·35	68	2·11	3·34
Warwick	1·73	75	0·64	3·09
Maranoa.				
Bungeworgorai ..	1·20	26	..	0·50
Roma	1·53	66	0·13	0·81

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1940.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Mean Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·01	78	68	81	15, 19	61	10	117	16
Herberton	..	68	55	73	16, 20	36	9	175	18
Rockhampton	30·19	77	56	81	21	43	10	..	..
Brisbane	30·25	71	51	77	21	43	23	107	6
Darling Downs.									
Dalby	30·28	70	41	78	16	25	23	91	3
Stanthorpe	..	63	33	70	17, 18	18	22	103	5
Toowoomba	..	64	46	70	19	33	8	211	7
Mid-Interior.									
Georgetown	30·06	83	58	88	20	34	10	5	1
Longreach	30·19	77	46	82	15, 16, 18–20	30	9	26	2
Mitchell	30·27	70	36	79	15	23	23, 24	8	1
Western.									
Burketown	30·08	84	61	89	19, 20	45	10	..	..
Boulia	..	78	48	85	15	37	9	..	..
Thargomindah ..	30·24	70	42	83	15	31	24	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August, 1940.		September, 1940.		MOONRISE. Aug., 1940.	MOONRISE. Sept., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·33	5·24	6·6	5·38	3·48	4·58
2	6·33	5·25	6·5	5·39	4·41	5·45
3	6·33	5·25	6 4	5·39	5·33	6·29
4	6·32	5·25	6·3	5·39	6·22	7·14
5	6·31	5 25	6·2	5·40	7·9	8·0
6	6·30	5·26	6·0	5·40	7·54	8·46
7	6·30	5·26	5·59	5·41	8·38	9·34
8	6·29	5·26	5·58	5·41	9 21	10·24
9	6·28	5·26	5·57	5·42	10·5	11·16
						p.m.
10	6·27	5·27	5.56	5·43	10·50	12·9
11	6·27	5 28	5·55	5·43	11·37	1·3
					p.m.	
12	6·26	5·29	5·53	5·44	12 27	1·57
13	6·24	5·29	5·52	5·44	1·19	2·51
14	6·23	5·30	5·51	5·45	2·13	3·45
15	6·23	5·30	5·50	5·45	3·8	4·36
16	6·22	5·31	5·49	5·46	4·2	5·27
17	6·21	5·32	5·47	5·46	4·56	6·18
18	6·20	5·32	5·46	5·46	5·49	7·9
19	6·19	5·32	5·45	5·46	6·41	8·0
20	6·18	5·33	5·44	5·47	7·33	8·51
21	6·17	5·33	5·43	5·48	8·23	9·43
22	6·17	5·34	5·41	5·48	9·14	10·34
23	6·16	5·34	5·40	5·49	10·5	11·26
24	6·15	5·34	5·39	5·50	10·57	..
						a.m.
25	6·14	5·34	5·38	5·50	11·49	12.18
26	6·13	5·35	5·37	5·51	..	1·8
					a.m.	
27	6·12	5·36	5·36	5·51	12·42	1·57
28	6·11	5·37	5·35	5·51	1·35	2·45
29	6·10	5·37	5·34	5·52	2·28	3·31
30	6·8	5·37	5·33	5·22	3·19	4·17
31	6·7	5·38			4·9	

Phases of the Moon, Occultations, &c.

4th Aug.	● New Moon	6	9 a.m.
10th ,,	☽ First Quarter	10	0 p.m.
18th ,,	○ Full Moon	9	2 a.m.
25th ,,	☾ Last Quarter	1	33 p.m.

Perigee, 6th August, at 1.0 p.m.
Apogee, 22nd August, at 8.0 a.m.

The most brilliant of "stars," Venus—for so many months the Evening Star—passed between the earth and the sun toward the end of June. In July, Venus was hailed by all who were abroad before dawn as the Morning Star, rapidly becoming brighter and higher in the eastern sky. On clear dark mornings in early August Venus will shine almost like an electric torch. Later her brilliancy will decrease as she draws away from the sun. About the middle of the month, however, she will still be bright enough to be seen in broad daylight. On 16th August the planet will be 19 degrees west of the sun.

Quite a number of meteors may be seen shooting from the north-east before dawn this month. They come in more or less abundance every year and are known as the Perseids. From 10th to 12th August they are often particularly active. It is fairly well established that they are fragments of debris left behind by Tuttle's comet, which approaches the sun every thirteen and a-half years.

It is said, "God's mills grind slow but sure." The slow but inexorable motions of His millstones, which have turned but once in 257 years, may be watched during this and the next few months, when Jupiter and Saturn will approach and pass each other no less than three times. The planets will also be in "Opposition" (opposite the sun) on the same day, 3rd November. A triple conjunction of Jupiter and Saturn is exceedingly rare, measuring by human standards, for the last time it occurred was in 1683. Jupiter moves faster than Saturn, so that on 7th August he will be quite near the ringed planet, but on 15th August he will pass a little north of Saturn. On 27th August Jupiter begins to move back along his path; Saturn does likewise on 4th September. This will cause another conjunction on 12th October. Jupiter continues his retrograde motion until 31st December, and Saturn until 10th January. On 20th February, 1941, the third conjunction occurs. These evolutions will keep the two planets together for no less than eight months.

2nd Sept.	● New Moon	2	15 p.m.
9th ,,	☽ First Quarter	5	32 a.m.
17th ,,	○ Full Moon	12	41 a.m.
25th ,,	☾ Last Quarter	3	47 a.m.

Apogee, 3rd September, at 4.0 p.m.
Perigee, 18th September, at 6.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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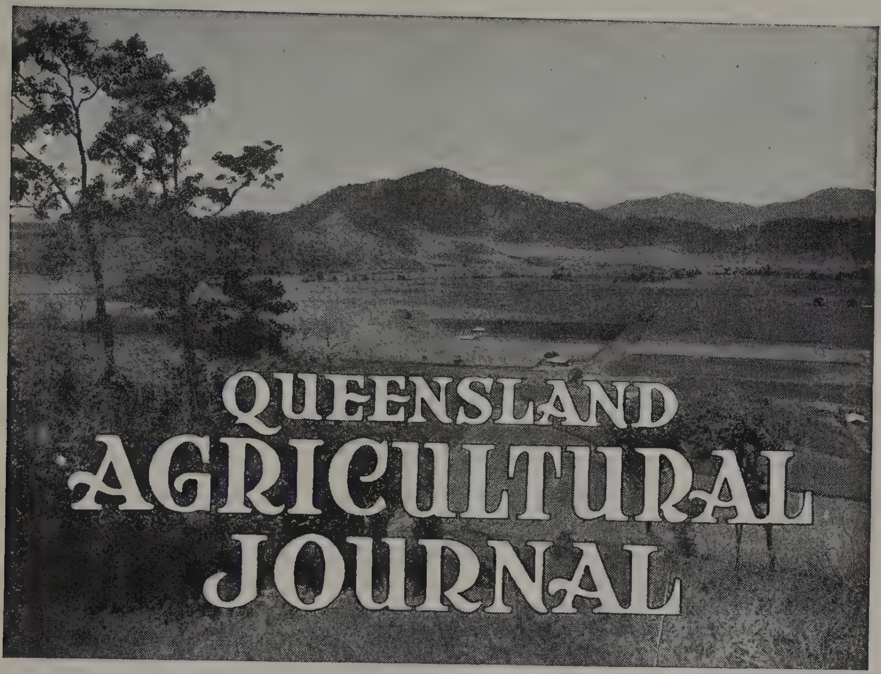
ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. LIV. 1 SEPTEMBER, 1940. Part 3.

Event and Comment

New Uses for Farm Products.

THE development of a new branch of agricultural science in America during the past few years was mentioned by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, in the Queensland Parliament recently. This new branch of science is called "chemurgy," and is expected to be of great value to Australia while the war is on. Actually, this new development is well known to Australian science workers, and they have been busy on it for some time.

In the United States a national farm chemurgic council has been constituted, which deals chiefly with the finding of new uses for farm products, apart from their use as food, and preventing the waste of unmarketable crops. The use of excess sugar cane for the making of power alcohol is a case in point.

The advantage of chemurgy is that it is based on farm crops, and it seeks the solution of marketing difficulties, rather than finding substitutes which might displace farm produce. Thus it brings both primary and secondary industry into closer relationship to the advantage of all concerned.

With their usual facility in adding new words to the English language, the Americans have found this new name, chemurgy, for the old process of converting a crop surplus, or crop residues, from waste into profit. The actual definition given to it is the winning of raw materials of industry from the soil, the air, and the sunlight by means of plant life.

Objects of the Chemurgic Movement.

THE specific objects of this chemurgic movement are stated in these words: "To find new non-food uses for farm produce and agricultural by-products, to prevent some of the economic loss which results from the tremendous volume of agricultural wastes which find only inferior markets or no market at all, and to enlarge the opportunities of farmers through the development of new crops which may be added to the agricultural economy."

In the United States, official recognition has been given to the soundness of these aims. Already over there 250 research workers are busy on a programme covering a wide range of products including maize, wheat, cotton, apples, peanuts, potatoes, sweet potatoes, tobacco, milk products, fruits, vegetables, and lucerne.

There is plenty of room for a chemurgic movement in Australia, Queensland particularly. The Old Country has contracted to buy our wool and our butter, but while the war lasts our prospects of increasing our exports of wheats,. fresh fruits, and, in fact, all products except the concentrated foodstuffs will probably become much less bright than they are.

In the light of present experience, there will be many new problems for our primary industries to tackle when the war is over. Wool substitutes, butter substitutes, over-production of wheat and fresh fruits may be among those new problems; so it is plain that we shall have to do all we can to find new industrial uses for our farm products.

Many things can be made from crop surpluses and wastes. For instance, power alcohol can be made from corn, potatoes, and molasses; plastic materials from cereals and skim milk, and so on. Incidentally, we are told that Argentine farmers are now selling their maize for furnace fuel as a substitute for imported coal.

An examination of present needs and opportunities will show that, so far, the surface of the chemurgic field has barely been scratched. Take fruit juices, for example. Much of our fruit gathered in the course of a season is unacceptable on the market because of undersize or other defects or deficiencies. There should be nothing to prevent undersized fruit from being pulped for its juice. Once the public becomes appreciative of the value and acquires a taste for pure fruit and vegetable juices, properly processed and subject to rigid quality control, the fruit juice industry would no doubt repeat, relatively, the spectacular results of American fruit processors. The consumption of fruit juices has increased astonishingly in the United States in recent years, to the advantage of the fruitgrowers generally.

From apple wastes come apple pectin, a jellying agent for jams and confectionery; while citrus wastes may be converted into stock feed and fertilisers. In America the use of agrol—a power alcohol produced from surplus grain crops—is expanding rapidly.

So, in this new scientific field many practical benefits bearing on or contributing to our war effort—and, later on, no doubt to our peace effort—are promised, or are, at least, in prospect. Its development must increase the activity, the profitable activity of our primary industries.

Soil Conservation.

ANOTHER very important matter discussed during the Assembly debate on the Burdekin River Trust Bill, introduced by Hon. Frank W. Bulcock, and which is of interest to every man on the land in every part of the State, was soil erosion or, to use a better term, soil conservation.

All over the world some of the best brains are working on the problem of preserving that top layer of soil without which we could not exist. The classic example of what soil erosion means is what is called the Dust Bowl in the United States where the surface soil in intensely tilled areas has literally gone with the wind. In fact every country, and especially the comparatively newly-settled lands, provides impressive examples of the penalties man has to pay for despising nature's law relating to the fitting use and conservation of fertile soil.

While the United States provides some appalling evidence of man's folly in mishandling the gifts of Providence, that country also provides glowing examples of new and strikingly successful methods of soil erosion control. Not only has erosion been checked in many areas, but eroded land has been reclaimed and in many cases, made richer than ever it was before.

"Not only does the American soil conservationist set to work to save the soil in a physical sense; he sets out to save it in a chemical, agricultural, and moisture sense," said Mr. Bulcock, in the course of his second reading speech. By terracing, contour-ploughing, and other methods, he has increased the moisture-holding capacity of lands which previously had been subject to serious erosion. That is one of the outstanding achievements of reclamation work in the Dust-bowl country where rainfall is usually very light. The conclusion of the modern agricultural engineering school is that soil conservation pays.

Our obvious job, then, is to be guided by the experience of other countries, particularly the United States, as to what to avoid and what to do in saving that spade's depth of soil from which we get our living.

Soil erosion is an insidious thing. Perhaps no single generation sees much of the consequences of wrong use of land. In South Africa, it probably took a couple of hundred of years for the erosion problem to emerge. The same thing may be said, perhaps, of the Argentine where sheet erosion became so serious as to impel the Government of that country to prohibit cultivation altogether in some districts and let the land go back to grass.

There are many causes of river, gully, and sheet erosion which are familiar to every farmer. One generation, after all, is only a trustee for the generation which is to come after. It is our duty, then, to protect our soil in every practicable way—by judicious clearing of timber, by tree reservations on hilltops and steep slopes and river banks, by contour cultivation and contour furrowing, and by all the other means prescribed on the basis of modern knowledge. If we do that, we shall have discharged a definite obligation to posterity.

The Pineapple Soils of the Nambour, Woombye, and Palmwoods Districts.

L. G. VALLANCE, M.Sc., Assistant Research Officer and H. L. WOOD, B.Sc., Assistant to Research Officer.

Continued from p. 101, August, 1940.—This article completes the second of a series of soil surveys covering the major pineapple-producing areas in southern Queensland. As the embodied data is necessarily of a technical nature, a short, non-technical discussion, with particular reference to the practical aspect of pineapple production in the Nambour-Woombye-Palmwoods area, will be presented shortly in this journal.

III. PHYSICAL ANALYSES AND MOISTURE RELATIONSHIPS.

Mechanical Analyses.

A REPRESENTATIVE sample of each horizon within the type profiles was submitted to mechanical analysis. The figures obtained (Appendix) agree very closely with the field texture classifications. Consequently, a field texture classification may be regarded as being sufficiently accurate for use in extension and advisory work. In many cases, in fact, it is to be preferred to the much more elaborate laboratory estimation since the field estimation can be done rapidly and repeated several times in any small area. Moreover, the very act of "kneading"

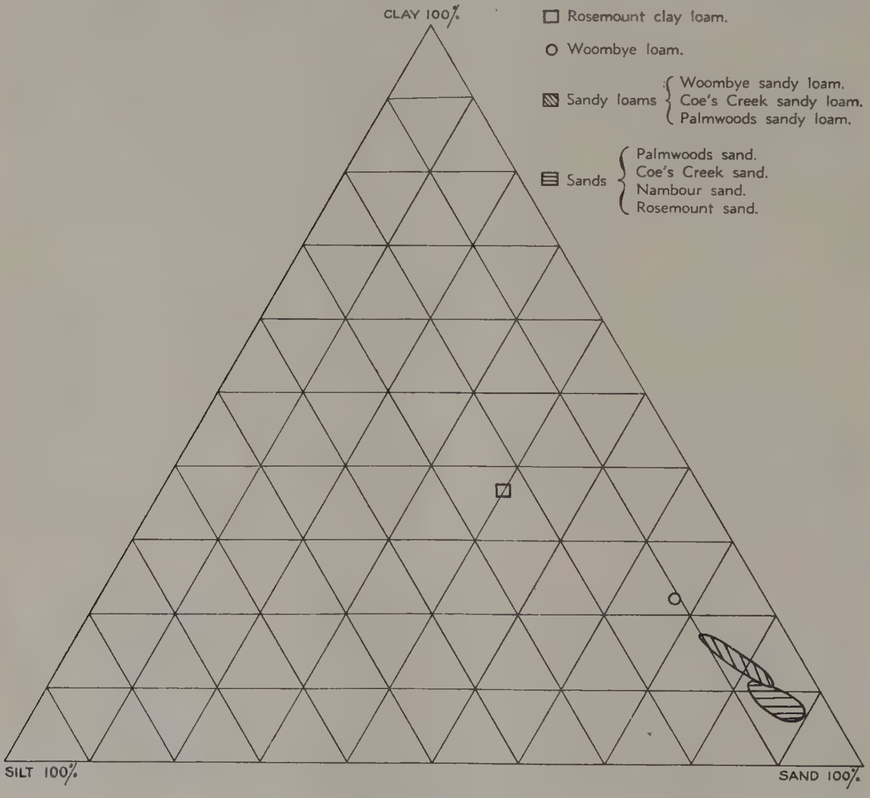


Plate 40.
MECHANICAL ANALYSIS DISTRIBUTION TRIANGLE OF SURFACE SOILS.

the soil in the hand at the requisite water content will give indications as to its permeability and consistence which is not necessarily revealed by a mechanical analysis. In the course of this survey, during which many hundreds of these field classifications were made, a striking agreement was observed to exist between the "feel" of moistened soil and its suitability for pineapple culture.

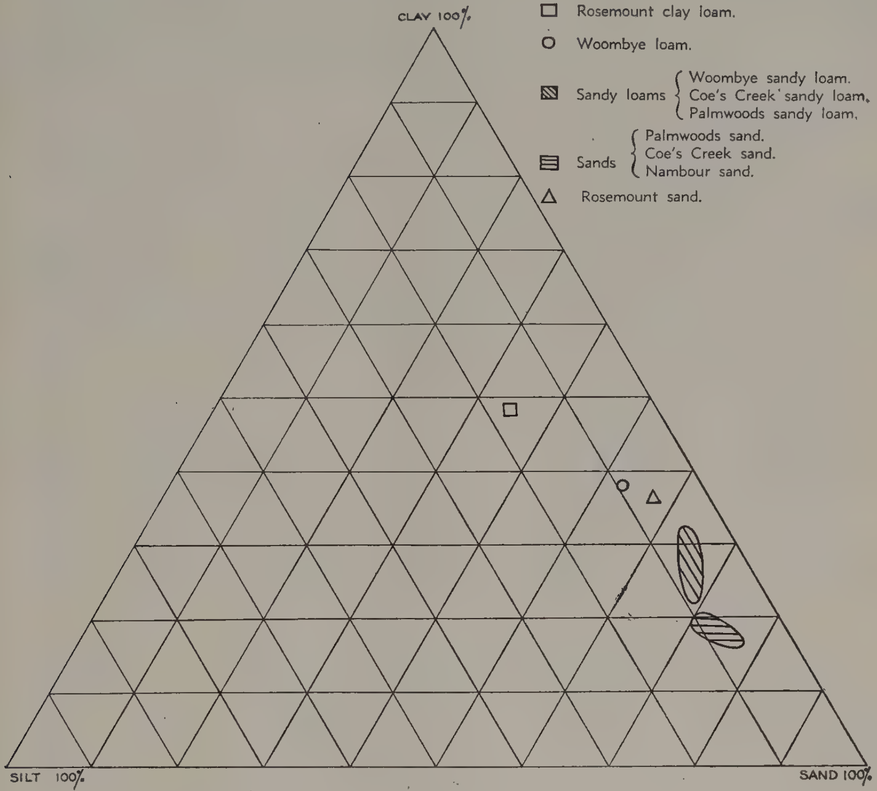


Plate 41.
Mechanical Analysis Distribution Triangle of Subsoils.

The mechanical analyses were carried out according to the method adopted by the International Society of Soil Science. In order to compare the textures of the surface horizons of the various soil types the mechanical analyses figures have been calculated as summation percentages of the sand, silt, and clay fractions. These have been plotted in Plate 40. For the sake of clarity the ranges covered by the sands and the sandy loams are shown as enclosed areas. As these fall close to that corner of the diagram which represents 100 per cent. sand, the general sandy nature of these surface soils is indicated. The samples refer to the A_1 horizons, the depth of which varies from 3 to 8 inches. These are typical of the majority of soils which are used for pineapple culture in the Nambour-Woombye-Palmwoods area. It is apparent that the sands and sandy loams are closely related texturally, and that there is a gradual transition from one class to the other. The position of the surface soil of the Rosemount clay loam illustrates the fundamental difference of this soil type.

The subsoils are similarly shown in Plate 41. The samples referred to are from the deeper portions of the B horizon proper, and may be regarded as the B_2. In some cases, e.g., the Nambour sand, this horizon is replaced by a BC. All of the subsoils show an appreciable increase in clay content. The greatest increase occurs in the Rosemount sand, in which there is slightly more than 35 per cent. clay. In the case of this soil type the sticky, highly impervious nature of the subsoil layer has a marked influence on the moisture relationships of the sandy A horizon, and its suitability for pineapple culture is determined very largely by the depth at which the B horizon occurs. These considerations apply not only to the Rosemount sand, however, but to all soil types within the district.

In order to present a clear picture of the particle size distribution of the surface soils the clay, silt, and sand fractions, expressed as summation percentages, have been plotted against the logarithm of the settling velocities. In Plate 42, the distribution of the particles is shown as a continuous function between the settling velocities of particles of size approaching the upper limit of coarse sand and the lower limit of silt. The settling velocities are spaced at equal intervals; thus the predominating particle sizes are those which lie along the steepest portion of the curve.

For all soils with the exception of the Rosemount clay loam, the dominant fraction is the coarse sand, that is, the fraction lying between the settling velocities 2·54 and 0·54, since the curve is always steepest over this part of its range. The similarity which exists in this respect between the loam, sandy loam, and sand soil types is carried, in a general way, into the 0·54 to 2·54 settling velocity range, i.e., the fine sand. The slope of the Rosemount clay loam is again markedly different.

There are, however, important differences between the loam, sandy loams and sands. Although all the curves flatten out as they approach the velocity whose logarithm is $_2$·54, they are by no means parallel. The slope indicates that there is a more uniform distribution of the particle size throughout the Woombye loam and Woombye sandy loam range, than in the sands and Palmwoods sandy loam. In the two latter groups, the maximum distribution of the particles is undoubtedly closer to the coarser end of the range of the fine sand fraction. This is also true of the Coe's Creek sandy loam, the curve for which is not shown, since it is typified by that of the Palmwoods soil. From these curves it will be observed that the soils of the grey-brown group—as represented by the Coe's Creek sandy loam, the Palmwoods sandy loam, and the several sand types—are notably coarser in texture than the Woombye series. This is in complete accord with the many field observations which were made during the course of the survey.

Throughout the range of the silt fraction—i.e., the interval 4·54 to 2·54—the curves for the Woombye soils are slightly steeper than those of the grey-brown soils, indicating a somewhat higher silt content. Generally, however, there is a very pronounced flattening of the curves in this region. The low silt contents are typical of the soils planted to pineapples not only in the area under review, but also in the Beerburrum-Glasshouse Mountains-Beerwah districts (6). The higher silt content of the Rosemount clay loam again differentiates this soil.

Structural Characteristics and Consistence.

The texture of the surface soils has a marked influence upon their structural characteristics. With the exception of the Woombye sandy loam, the sandy loams and sands are structureless. This is implied by the nature of the curves as shown in Plate 42. In these latter types, the predominance of the sand fraction and its high degree of coarseness is indicated by the steepness of the curve at the higher settling velocities. The single-grain nature of these surface soils is a reflection of the low content of clay, silt, and organic matter.

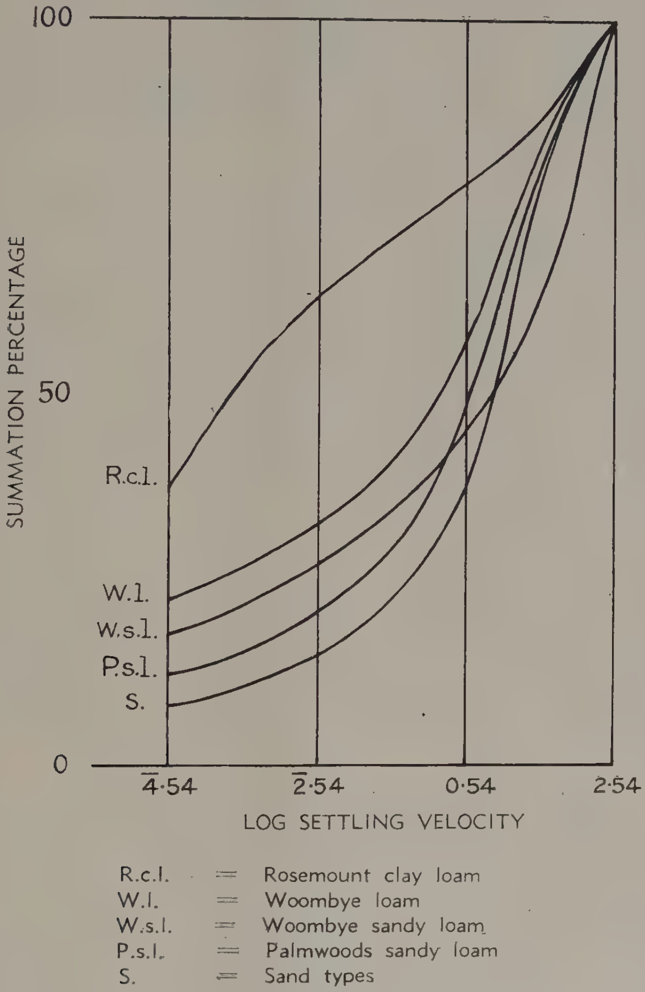


Plate 42.

Summation Curves Illustrating Typical Mechanical Analyses of Surface Samples of the Various Soil Types.

Throughout the A_1 horizon of the Woombye loam, the particle size of the sand fraction is spread uniformly over the coarse sand–fine sand range, the fine sand grading into silt. The Woombye loam contains a greater percentage of both this latter constituent and of clay, than the sands and sandy loams. These features, together with the increased organic content (Appendix) give rise to a definite structure development. Under virgin conditions, a marked crumb formation is apparent in the top two inches. The aggregates are firm, but may be crushed by the fingers. They are discrete particles, approximately 5 m.m. in diameter. Underlying this zone, the remainder of the A_1 horizon is characterised by the presence of soft, irregular aggregates. The porosity afforded by this structural development allows efficient water movement, and root penetration is quite good. If it is puddled at its sticky point, however, this soil will lose its normal state of aggregation very rapidly, its consistence will change, and it will become moderately plastic. This is in marked contrast to the behaviour of the single-grained soils of the sandy loam and sand types. Obviously therefore, the correct management of the Woombye loam is important: excessive cultivation at or near its sticky point should be avoided, particularly with heavy implements.

The surface soil of the Woombye sandy loam does not show a well-defined structure, although incoherent aggregates occur through the topmost portion of the A horizon. A crumb structure is rarely developed. The surface soils of this type may be worked at almost any moisture content without fear of compaction. This does not apply to its sub-surface horizon, however. Under virgin conditions the sub-surface horizon is porous and loose, but it compacts with cultivation, particularly if tilled with heavy implements when the soil is at or near the sticky point. During the survey, this was frequently demonstrated by the ease with which a 4-inch auger penetrated virgin, as compared with cultivated, soil. Movement of water through the compacted zones is impeded, with a consequent effect on the moisture relationships of the surface horizon.

However, the unfavourable effect of faulty soil management on the consistence of the sub-surface horizon is more noticeable in the heavier textured Woombye loam than in the Woombye sandy loam. When the impedance of water movement resulting from compaction is considered in relation to the prevailing rainfall conditions, it is apparent that periods must occur in which the soil moisture conditions are unfavourable to crop plants with rooting habits such as those of the pineapple. For these reasons, the Woombye loam cannot be regarded as being as suitable for pineapple culture as the Woombye sandy loam.

Profile Development in Relation to Aeration.

Under conditions of heavy, though intermittent rainfall, a shallow sandy A horizon overlying an impermeable subsoil is not a suitable medium for the growth of pineapples. During rainy periods there is a rapid infiltration of water into the surface soil, and if this cannot readily escape through the heavy B horizon, temporary waterlogging of the root zone may ensue. Because of the extreme sensitivity of pineapple roots to deficient soil aeration, the inter-relation of soil type and prevailing climatic conditions is a consideration of the utmost importance.

In order to show the significance of the variation of texture with depth, diagrams have been prepared for the various soil types, in which the clay content at different levels has been plotted against the depth at which it occurs. These are shown in Plate 43. In the Rosemount sand and Palmwoods sandy loam it is quite clear that there is a large increase in the clay content at a depth of approximately 18 inches.

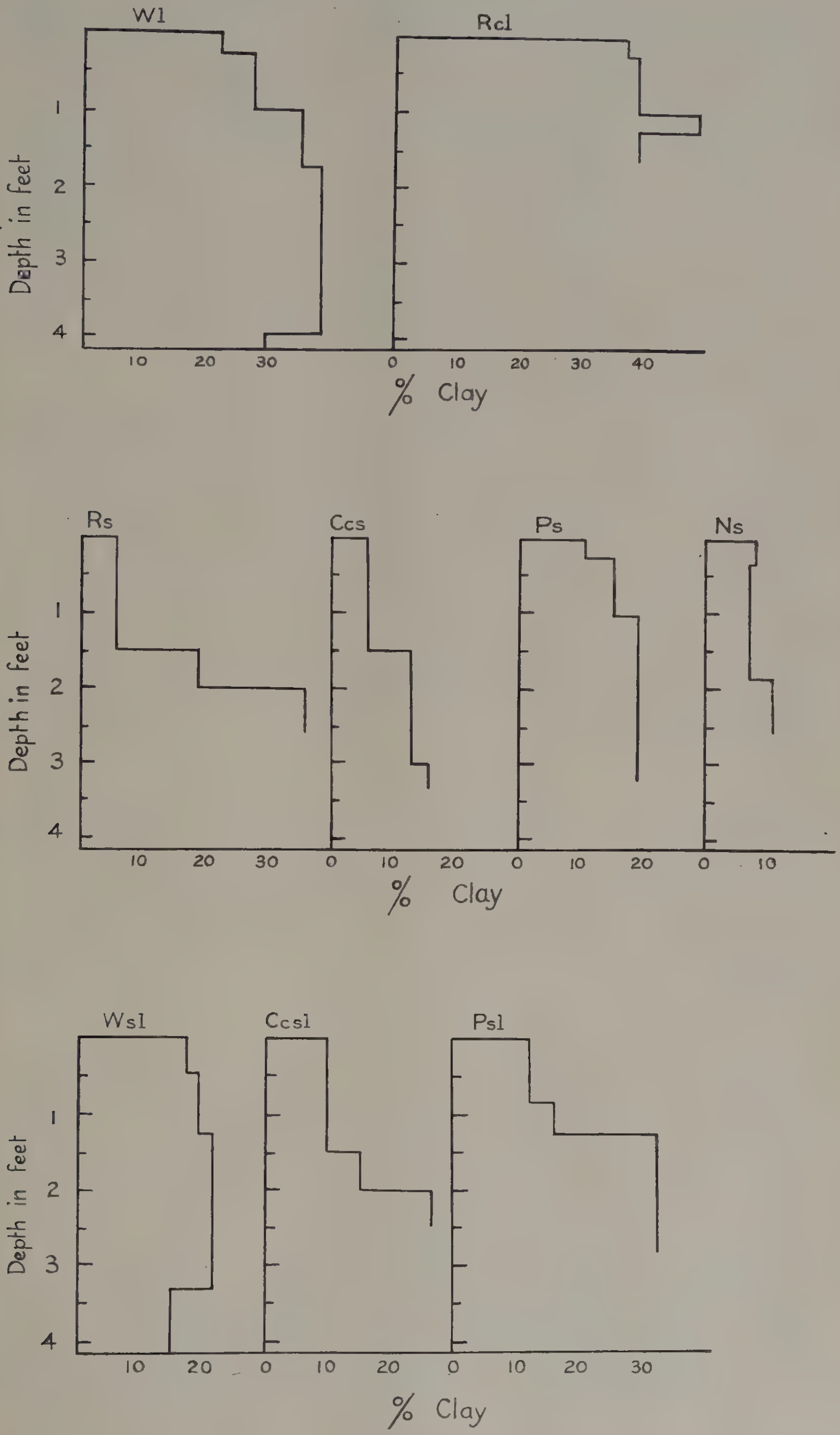


Plate 43.

Profile Development of Soil Types, Showing the Increase in Clay Content with Depth.

The sands and sandy loams of the Coe's Creek series show similar profile developments, although in the normal profile the A horizon is slightly deeper.

The nature of the slope is a major factor governing the extent to which the shallower phases of these types may be cultivated. When such areas lie at the foot of a slope they should be avoided, though areas of similar nature occurring on ridge slopes may be utilised if adequate attention is given to drainage.

There is a much greater uniformity in the texture of the various horizons within the profile of the Woombye sandy loam (Plate 43). In this soil, there is considerably less danger of "overwatering" of the surface horizon during wet periods because the subsoil is not only more permeable than those of the soils already discussed, but there is also a much smaller difference in the rate of water movement through the surface and subsoil layers.

With the exception of the Rosemount clay loam, Plate 43 also shows that the Woombye loam is the heaviest of the soils used for pineapple culture within the Nambour-Woombye-Palmwoods area. Its behaviour, under cultivation, points to the fact that a degree of waterlogging may sometimes occur, which is serious enough to affect the pineapple plant. This is particularly the case in those areas which receive run-off water from higher levels. Rain falling directly on this relatively heavy soil is rarely the cause of waterlogging, since the penetration is low once the moisture equivalent is reached. If surface water is allowed to accumulate, however, it will penetrate until impeded by the B horizon, which has a slower rate of percolation. When planting this soil to pineapples, therefore, it is important to avoid not only depressions, but also locations in which the gradient does not permit free run-off of surface water.

The foregoing remarks apply equally to the Rosemount clay loam. In this soil, the profile is very shallow. Due to its relatively higher organic matter content, and the stability of the structural aggregates, the surface soil is quite open and porous. However, the subsoil, which occurs at a depth of 12 inches, is sticky, and percolation of water is very slow. Nevertheless, if there is sufficient slope to ensure quick run-off, and careful attention is paid to drainage, it is possible to overcome the temporary waterlogging which would otherwise occur during prolonged rainy periods.

Moisture Equivalents.

Moisture equivalent determinations were carried out on a large number of surface soils from each type. These were made by centrifuging 30 gm. of moist soil in a field of 1,000 times gravity. The values obtained are given in Table III. Although some variation occurs within each type, there is a broad agreement between the moisture equivalent values and texture classification. The figures also indicate the heavier nature of the dark brown–red-brown group (Woombye series) as compared with the grey-brown soils of the area. In this latter group, the values for the Nambour and Rosemount soils are very low, which is to be expected from their general sandy nature. There is very little difference in the figures of the Woombye, Palmwoods, and Coe's Creek sandy loam. The highest moisture equivalents recorded in the district are those of the Rosemount clay loam, the figures for which are not given in Table III. Three samples of this type, however, gave values ranging from 26 per cent. to 33 per cent.

TABLE III.

DISTRIBUTION TABLE OF MOISTURE EQUIVALENT VALUES (PER CENT.) OF SURFACE SOILS.

Moisture Equivalent Per Cent.	<4.	4–6.	6–8.	8–10.	10–12.	12–14.	14–16.
Woombye loam	..	..	..	..	6	10	4
Woombye sandy loam	..	..	..	13	5	1	..
Palmwoods sandy loam	..	..	1	8	3	1	1
Coe's Creek sandy loam	..	..	1	4	3	4	..
Palmwoods sand	..	..	6	2	..	..	..
Coe's Creek sand	..	2	7	3	1	..	..
Nambour sand	2	4	4	3	..	..	..
Rosemount sand	1	5	4	..	..	..	..
No. of samples	3	11	23	33	18	16	5

Wilting Coefficient.

B. daCosta (1) has adduced evidence showing that the soil moisture content at which permanent wilting occurs coincides very closely with a pF value of 4·2. Using the freezing point method, a series of pF determinations were made on a selected number of typical samples of the various soil types under discussion. From the data obtained, the wilting coefficients were calculated as percentages of the oven dry weight, and these are set out in Table IV.

TABLE IV.

WILTING COEFFICIENTS DETERMINED FROM THE DEPRESSION OF FREEZING POINT OF SOME TYPICAL SURFACE SOILS.

Soil Type.	Wilting Coefficient (Per Cent. Dry Weight).
Woombye loam	9·9 8·9 8·9
Woombye sandy loam	6·8 7·2 6·8
Palmwoods sand	5·4 5·8
Palmwoods sandy loam	7·8 6·0
Nambour sand	5·4 5·4
Coe's Creek sandy loam	5·9 7·0
Coe's Creek sand	3·8 3·9
Rosemount sand	3·7 3·4
Rosemount clay loam	17·0 24·0

The figures indicate a general grouping according to texture classes. This is not unexpected, since the soils are of similar origin, and the samples are from corresponding horizons. The highest wilting co-efficient is that of the Rosemount clay loam. The sandy loams have values intermediate between the Woombye loam and the several sand types. In this respect there is a marked similarity to the distribution of the moisture equivalent values.

Soil Moisture.

Since the uneven distribution of the rainfall throughout the year is a major climatic feature of the Nambour-Woombye-Palmwoods area, the moisture relationships of the various soil types assume considerable importance in determining their value for agricultural purposes. Reference to Plate 6 shows that, during the spring period, the monthly precipitation is less than the evaporation as calculated from the monthly saturation deficit. At the end of this period bush fires are prevalent, and the resultant loss of organic material from the surface cover is very great. Under such conditions, the suitability of each soil type for pineapple culture depends chiefly upon its capacity to supply water to the roots which, in this crop, are mainly restricted to the surface horizons.

Tables III. and IV. show that as the moisture equivalent values increase from the light sandy soils to the heavier types, there is also an increase in the wilting coefficients. The relationship which exists between these two single-value factors is shown in Plate 44 in which the moisture equivalents of a number of surface soils of all types are plotted against their wilting coefficients. However, the scatter of the points suggests that it would be unwise to regard the wilting coefficient as a constant function of the more easily determined moisture equivalent.

The moisture equivalent is not necessarily an absolute index of field capacity. This latter term is defined as that percentage of moisture which a soil will hold after all free water has drained away. Generally, such a condition occurs within one to three days after soaking rain. The agreement which has been found to exist between the moisture equivalent and the field capacity in the surface horizons of a number of soils from the Nambour-Woombye-Palmwoods area is shown in Table V.

TABLE V.

SHOWING RELATION BETWEEN MOISTURE EQUIVALENT AND FIELD CAPACITY OF CERTAIN SURFACE HORIZONS.*

Type.	$\frac{\text{Field Capacity}}{\text{Moisture Equivalent.}}$
Woombye loam	0·91
Woombye sandy loam	0·99
Rosemount sand	1·50
Coe's Creek sand	1·50

* These figures are taken from a series of field moisture investigations at present in progress on southern Queensland soils. They represent the means of many soil moisture and moisture equivalent determinations.

The field capacity of the Woombye loam is slightly less than its moisture equivalent. In the Woombye sandy loam the two values are practically identical, while in the sands the field capacity is considerably greater than the moisture equivalent.

The "available" moisture at field capacity is regarded as the total moisture at field capacity minus the moisture percentage at the wilting coefficient. Some typical figures for available moisture of surface soils obtained in this way are as follows:—Woombye sandy loam 4·0 per cent., Woombye loam 2·0 per cent. Coe's Creek sand and Rosemount sand 2·0-2·5 per cent. The figures for field capacity were determined by actual field measurement, but it would have been equally valid to have obtained them by applying the requisite factor (Table V.) to the moisture equivalent.

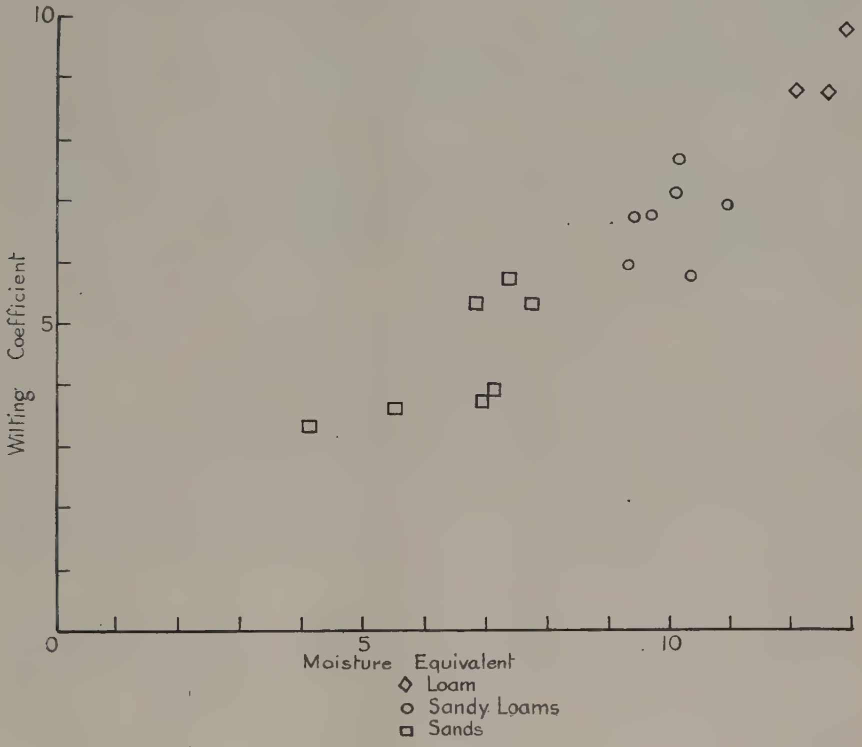


Plate 44.

Having due regard to the climatic conditions prevailing in the Nambour-Woombye-Palmwoods area the most favourable moisture relationships for pineapple growth occur in the sandy loams. This is reflected in the better growth which pineapples make during extended dry periods on soils of this type—and, to a lesser extent, on the sands—as compared with those of the Woombye loam type, especially where deterioration in the physical condition of the latter type has occurred as a result of faulty cultural practices. Although the drying out of the surface is greatest in the sand types, there is an appreciable diurnal addition of moisture from dew which condenses in the trough-shaped pineapple leaves (4). These small but regular increments are much more effective on sandy soils with their low wilting points, than they are on heavier types, such as the Woombye loam.

In the Nambour-Woombye-Palmwoods area, it has been found that the occurrence of the disease known as "top rot" or "wet rot" in young pineapple plants (3) is closely correlated with soil moisture relationships. Although the disease occurs on all soil types in this area, its incidence is most severe under conditions of poor drainage. Top rot is particularly associated with very shallow surface soils of a sandy nature which overlie heavy subsoils. It is also prevalent on depressed areas in the Woombye loam, and on those where run-off is restricted. It is least likely to occur on the Woombye sandy loam and Coe's Creek sandy loam. In order to reduce the incidence of top rot, the following factors must be given careful attention when selecting land for pineapple culture:—

(1) Permeability of the surface horizon.

(2) Depth of the zone of impedance.

The effect of the microtopography of the plantation site upon these two factors is important. Many areas which once were susceptible to severe outbreak of this disease have since been successfully replanted to pineapples by the application of preventive cultural practices, viz., re-orientation of the crop rows to ensure maximum drainage and the rapid removal of surplus water.

IV. CHEMICAL ANALYSES.

A large number of surface soils representative of each type were selected for laboratory investigation. These were all taken from uncultivated areas in order that the chemical constitution of the soils in their virgin state could be determined. Each sample represents an average of three samples to a depth of 9 inches. In most cases, samples taken to this depth comprise the whole of the A_1 horizon and the topmost portion of the A_2 horizon. All percentages refer to the air dried soil passing a 2 m.m. sieve.

TABLE VI.

DISTRIBUTION OF ORGANIC CARBON (PER CENT.) OF SURFACE SOILS.

Per Cent. Organic C.	·5–1·0.	1·0–1·5.	1·5–2·0.	2·0–2·5.	2·5–3·0.
Woombye loam	..	..	1	13	6
Woombye sandy loam	..	3	5	9	2
Palmwoods sandy loam	..	..	8	5	..
Coe's Creek sandy loam	..	1	3	2	4
Palmwoods sand	..	2	5	..	1
Coe's Creek sand	..	3	4	4	2
Nambour sand	2	4	5	1	..
Rosemount sand	2	5	4	..	..
Rosemount clay loam	..	..	..	..	..
All types	3	18	35	34	15

Per Cent. Organic C.	3·0–3·5.	3·5–4·0.	4·0–5·0.	5·0–6·0.	6·0–7·0.
Woombye loam	1	..	..	..	..
Woombye sandy loam	..	..	..	..	..
Palmwoods sandy loam	..	1	..	..	..
Coe's Creek sandy loam	2	..	..	..	..
Palmwoods sand	..	..	..	..	..
Coe's Creek sand	..	..	..	..	..
Nambour sand	..	..	..	..	..
Rosemount sand	..	..	..	..	..
Rosemount clay loam	..	..	1	1	1
All types	3	1	1	1	1

Organic Carbon, Nitrogen, and C : N Ratio.

The figures for the organic carbon content of the surface soils are given in Table VI. No carbonates are present under virgin conditions. The organic carbon content of the Rosemount clay loam, in its virgin state, is regarded as being very fair to good, and, as previously mentioned, the structure and general physical condition of this soil is satisfactory. As the texture of these surface soils becomes more sandy, however, their carbon content decreases, that of both the Nambour and Rosemount sands being extremely low.

As in the case of organic carbon there is a marked correlation between textural characteristics and total nitrogen content (Table VII.). With the exception of the Rosemount clay loam the nitrogen content of these soils cannot be regarded as good. Of the two major soil groups, the Woombye loam contains the greatest amount, but even in this soil there is a considerable variation between samples and few have been found to contain more than 0·15 per cent.

TABLE VII.

Distribution of Nitrogen (per Cent.) of Surface Soils.

Per Cent. N.	·025–·05.	·05–·075.	·075–·10.	·10–·125.	·125.–·15	·15–·20.	·20–·25.	·25–·30.	·30–·35.	—
Woombye loam	..	..	7	3	5	4	2	..	..	..
Woombye sandy loam	..	..	10	3	5	1	..	..	..	..
Palmwoods sandy loam	..	1	10	2	..	1	..	..	..	..
Coe's Creek sandy loam	..	1	5	2	4	..	..	..	..	..
Palmwoods sand	..	4	4	..	..	..	..	..	..	..
Coe's Creek sand	2	3	6	2	..	..	..	..	..	..
Nambour sand	3	5	4	..	..	..	..	..	..	..
Rosemount sand	2	5	3	..	..	..	..	..	..	..
Rosemount clay loam	..	..	..	..	..	1	..	1	1	..
All types	7	19	49	12	14	7	2	1	1	..

The carbon : nitrogen rations are given in Table VIII. For the majority of the surface soils this ratio is a wide one, implying that the greater part of the organic matter present is of a woody nature. Such conditions are in keeping with the vegetation associations of the area, as these give rise to a surface litter unfavourable to the production of humified material. Table VI. shows that the organic carbon content of all soils is distributed around a mean of 2 per cent. In general, the dark brown–red-brown group as exemplified by the Woombye series have narrower C : N ratios than the grey-brown soils.

TABLE VIII.

DISTRIBUTION OF C : N RATIOS OF SURFACE SOILS.

C : N Ratios.	10–15.	15–20.	20–25.	25–30.	30–40.
Woombye loam	2	10	7	2	..
Woombye sandy loam	2	10	6	1	..
Palmwoods sandy loam	..	5	7	2	..
Coe's Creek sandy loam	..	2	8	2	..
Palmwoods sand	..	1	5	1	1
Coe's Creek sand	..	..	6	7	..
Nambour sand	..	3	9	..	..
Rosemount sand	..	3	7	..	..
Rosemount clay loam	..	1	2	..	..
All types	4	35	57	15	1

Replaceable Bases.

Estimations of replaceable bases have been made on surface soils from all types. The figures for replaceable K, which are used as an index of potassium availability, are given in Table IX.

TABLE IX.

DISTRIBUTION OF REPLACEABLE K (M.E. PER CENT.) OF SURFACE SOILS.

Replaceable K. m.e. per Cent.	<·10.	·10–·20.	·20–·30.	·30–·40.	·40–·50.	·50–·60.	·60–·70.	·70–·80.
Woombye loam	..	..	1	1	3	2	..	2
Woombye sandy loam	3	..	1	..	2	..	1	..
Palmwoods sandy loam	5	1	..	..	..	..	..	..
Coe's Creek sandy loam	2	1	3	3	..	1	..	..
Palmwoods sand	2	2	4	..	..	..	..	..
Coe's Creek sand	..	1	5	3	..	..	..	..
Nambour sand	1	..	5	2	1	..	1	1
Rosemount sand	1	1	3	1	..	..	..	1
Rosemount clay loam	2	1	..	..	..	..	..	..
All types	16	7	22	10	6	3	2	4

Although there is considerable variation in each soil type, the figure obtained from the majority of the estimations on all soil types is less than 0·31 m.e. of replaceable K per 100 grams of air dry soil. In the Woombye loam the mean level of replaceable K was higher than in any other of the soils examined. A majority of the samples of this soil were found to contain between 0·4 and 0·6 m.e., while two contained in excess of 0·7 m.e. The widest range occurs within the Nambour sand where some unexpectedly high values of between 0·6 and 0·8 m.e. were obtained, although the majority of the samples contained less than 0·3 m.e.

Tables X. and XI. show the replaceable calcium and magnesium content of surface soils. The former element is the major exchangeable constituent. In general, the figures are not high, and they are in keeping with the slightly acid nature of the soils. While none of the analyses suggest the presence of an absolute deficiency of lime or magnesia, the low base status of these soils is evident.

TABLE X.

DISTRIBUTION OF REPLACEABLE Ca (M.E. PER CENT.) OF SURFACE SOILS.

Replaceable Ca. m.e. per Cent.	1·0–2·0.	2·0–3·0.	3·0–4·0.	4·0–5·0.	5·0–6·0.	6·0–7·0.	7·0–8·0.
Woombye loam	1	1	4	2	1	..	..
Woombye sandy loam	2	4	2	..	1	1	..
Palmwoods sandy loam	..	4	2	..	..	..	..
Coe's Creek sandy loam	..	1	1	1	2	..	..
Palmwoods sand	1	1	1	..	..	..	..
Coe's Creek sand	1	..	2	..	1	..	..
Nambour sand	..	..	4	1	1	2	1
Rosemount sand	..	1	2	..	1	..	..
Rosemount clay loam	2	..	..	..	..	1	..
All types	7	12	18	4	7	4	1

TABLE XI.

DISTRIBUTION OF REPLACEABLE Mg (M.E. PER CENT.) OF SURFACE SOILS.

Replaceable Mg. m.e. Per Cent.	<·5.	·5–1·0.	1·0–1·5.	1·5–2·0.	2·0–2·5.	2·5–3·0.	3·0–3·5.
Woombye loam	2	3	3	1	..	..	1
Woombye sandy loam	..	1	..	4	1	1	2
Palmwoods sandy loam	3	..	1	2	..	..	..
Coe's Creek sandy loam	..	..	1	3	..	1	..
Palmwoods sand	1	2	..	..	..	..	..
Coe's Creek sand	..	1	..	1	2	..	..
Nambour sand	4	2	1	1	..	..	1
Rosemount sand	..	1	..	3	..	..	..
Rosemount clay loam	..	1	..	2	..	..	..
All types	10	11	6	17	3	2	4

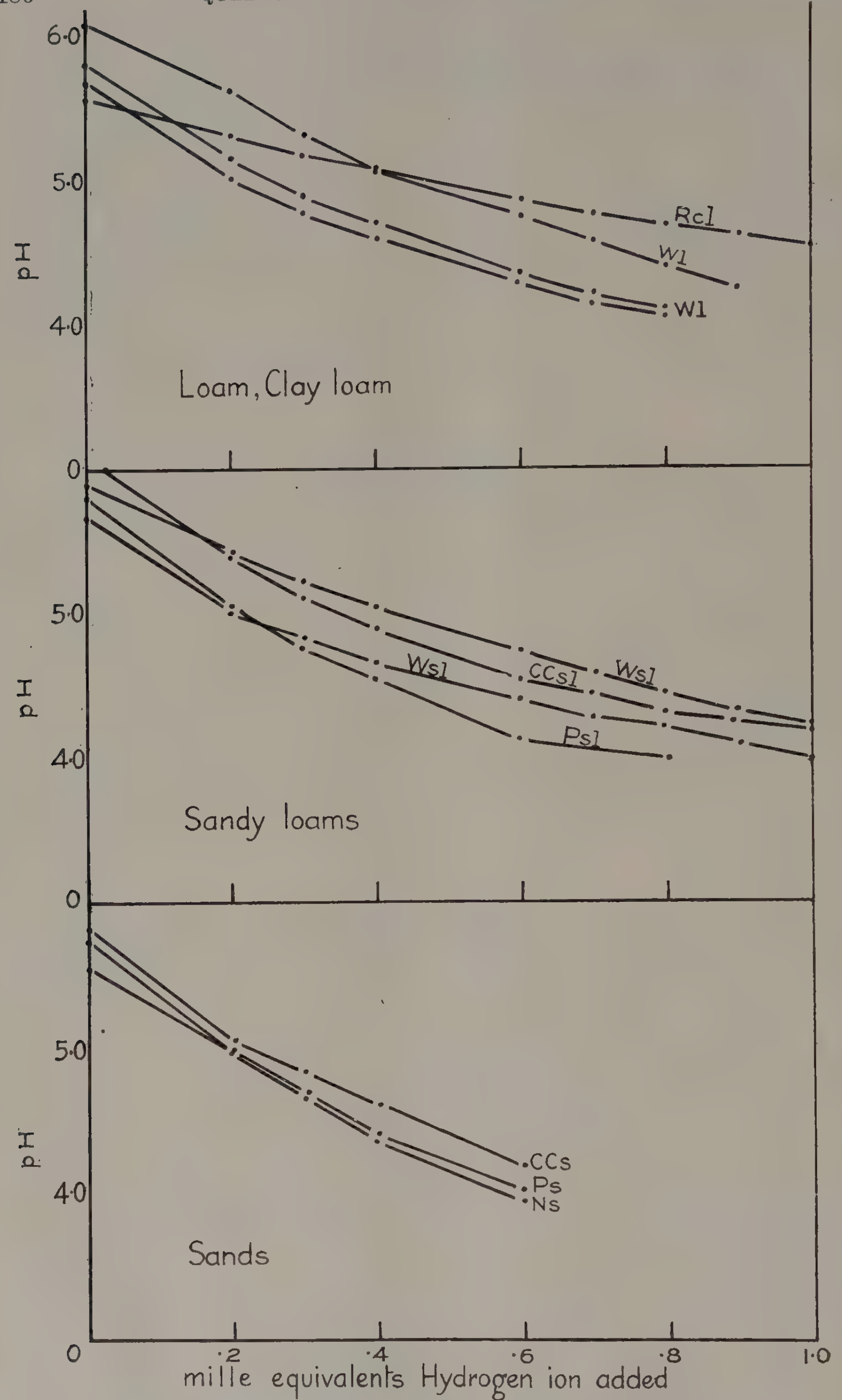
Phosphoric Acid.

Determination of available phosphoric acid was carried out according to Truog's method, since data obtained in this way are being used as an index of the phosphate requirement of the pineapple plant. The results of the phosphoric acid determinations are given in Table XII.

TABLE XII.

DISTRIBUTION OF AVAILABLE P (PARTS PER MILLION) OF SURFACE SOILS.

Available P ; Parts per Million.	1.	2.	3.	4.	5.
Woombye loam	10	6	3	1	..
Woombye sandy loam	..	..	14	..	..
Palmwoods sandy loam	13	1	..	..	..
Coe's Creek sandy loam	4	1	7	..	..
Palmwoods sand	..	6	1	..	..
Coe's Creek sand	5	1	4	1	2
Nambour sand	1	7	3	1	..
Rosemount sand	2	7	..	1	..
Rosemount clay loam	3	..	..	..	..
All types	38	29	32	4	2



R.c.l. = Rosemount clay loam.
CCsl. = Coe's Creek sandy loam.
CCs. = Coe's Creek sand.
Wl. = Woombye loam.
Wsl. = Woombye sandy loam.
Psl. = Palmwoods sandy loam.
Ps. = Palmwoods sand.
Ns. = Nambour sand.

Plate 45.
BUFFERING CURVES OF SURFACE SOILS.

The available phosphoric acid content is extremely low in all soil types; none were found to contain more than five parts per million. For the successful production of pineapples in these soils, therefore, adequate phosphatic fertilisation is necessary.

The phosphate which is soluble in constant boiling point hydrochloric acid is also low. This will be seen by reference to data tabulated in the Appendix. Out of ten estimations, seven samples contained less than 0·05 per cent. P_2O_5. The highest content occurs in the Rosemount clay loam, viz., 0·077 per cent. P_2O_5. These low values are characteristic of the weakly podsolised coastal soils of southern Queensland.

Hydrochloric Acid Analyses.

Samples from the various horizons of the type profiles were digested with constant boiling point hydrochloric acid. The analyses of the acid extracts are given in the Appendix. In general, the values for lime, magnesia, potash, and phosphate are low, and they are in accord with the slightly acid reactions of these soils. The C horizons, which are decomposition layers overlying the parent rock, are also poorly supplied with these constituents. However, there is, in general, an increased concentration of Ca, Mg, and P in the surface horizons resulting from the decomposition of plant residues. In all profiles, the greatest percentage of calcium occurs within the A_1 horizon while a similar—though less marked—distribution was found in the case of magnesium. The figures for P_2O_5 also indicate a tendency for the A_1 horizon to be richer in this constituent than the illuvial portion of the solum. Potash is distributed throughout the profile, there being no tendency for it to accumulate in any one horizon.

A noticeable feature of these soils is the enrichment of the illuvial zone by sequioxide material.

Reaction, Buffer Capacity and Sulphur Requirement.

Reaction.—All pH determinations were carried out by means of the glass electrode. From Table XIII. it will be seen that the reaction of the majority of the surface soils lies within the range pH 5·4 to 6·2. Within each soil type the range is limited. Moreover, with the exception of the Rosemount clay loam, there is no great variation from type to type. The Rosemount soil, which contains the highest percentage of organic matter of any soil of the area, is also the most acid. The least acid soils are those which comprise the dark-brown–red-brown Woombye series, but the differences between the pH values of this series and those of the grey-brown group are slight.

Buffer Capacity.—During the past few years, field experience has demonstrated that the optimum soil reaction value for the growth of pineapples in southern Queensland soils lies within the range 5·0 ± 0·4. The application of sulphur to obtain the desired degree of acidity is now a general practice in the Nambour-Woombye-Palmwoods area. It is specially of value in the control of pineapple wilt (2), and the beneficial effects are particularly marked in those soils which have been planted to pineapples for a number of years.

TABLE XIII.

DISTRIBUTION OF pH VALUES OF SURFACE SOILS.

pH.	4·8–5·0.	5·0–5·2.	5·2–5·4.	5·4–5·6.	5·6–5·8.	5·8–6·0.	6·0–6·2.	6·2–6·4.	6·4–6·6.	Arith. Mean.
Woombye loam	..	..	..	..	6	5	6	2	2	5·99
Woombye sandy loam	..	..	..	..	2	4	11	2	..	6·03
Palmwoods sandy loam	..	..	2	1	9	2	..	..	..	5·64
Coe's Creek sandy loam	..	..	..	1	6	3	2	..	..	5·81
Palmwoods sand	..	..	..	..	2	4	2	..	..	5·87
Coe's Creek sand	..	..	7	2	3	1	..	..	..	5·47
Nambour sand	..	..	2	2	4	5	..	..	..	5·68
Rosemount sand	..	..	..	..	5	5	..	..	..	5·82
Rosemount clay loam	1	..	..	2	..	..	..	..	..	5·29
All types	1	..	11	8	37	29	21	4	2	5·73

The amount of sulphur required varies with the initial pH and the buffering capacity of the soil. The method which has been adopted for determining the buffering capacity is as follows:—Sulphuric acid (0·05 normal) is added to 20 gm. samples of air-dried surface soil (passing 2 m.m. sieve) in increments corresponding to 0·1 mille equivalents of hydrogen ion. The mixtures in duplicate are stoppered and shaken overnight, when apparent equilibrium is obtained. The pH is then determined, using a saturated calomel-glass electrode system in conjunction with a Cambridge electrometer valve pH meter. The duplicates show good agreement and are always reproducible.

The buffering curves of a large number of surface soils of all types were determined in this way. Some typical examples of these curves are given in Plate 45. It is evident that the heavier textured soils oppose any change in reaction more strongly than do the sandier types. The greatest inactivation of added hydrogen ion occurs in the Rosemount clay loam. This soil has a high organic matter content, and its base exchange capacity is known to be the highest of all soils examined in the area. The curves are similar in nature, in that there is a general tendency to flatten out as the pH decreases.

Sulphur requirement.—Field experience has shown that the calculated equivalent of sulphur, as indicated by the laboratory determination of buffer capacity, agrees remarkably well with the amount of powdered sulphur which it is necessary to apply to the soil before planting. It may be assumed, without serious error, that the depth to which sulphur affects the soil reaction is about 6 inches. The soil weight at this depth is, approximately, as follows:—Rosemount clay loam—1,400,000 lb., Woombye loam—1,700,000 lb., sandy loams—1,800,000 lb., sand types—2,000,000 lb. Using this data, the amount of sulphur required to bring the field reaction within the required region has been calculated from the buffering curves. From field determinations of pH and texture, the required amounts of sulphur may be estimated from Table XIV.

TABLE XIV.

SULPHUR REQUIREMENT (POUNDS PER ACRE) OF SOIL TYPES.

Initial pH.	6·5–6·0.	5·9–5·8.	5·7–5·6.	5·5–5·4.
Rosemount clay loam	..	..	500	300
Woombye loam	600	500	400	300
Woombye sandy loam Palmwoods sandy loam Coe's Creek sandy loam	500	400	300	200
Palmwoods sand Nambour sand Coe's Creek sand Rosemount sand	400	300	200	200

V. PEDOGENESIS.

The pedogenesis of the soils of the Nambour-Woombye-Palmwoods area has been discussed by Vallance in a detailed investigation of the nature and significance of the silica-sesquioxide ratios and exchange capacities.* In general, there is a well marked degree of uniformity in the silica-alumina ratios of their A and B horizons. The probable molecular compositions of the soil colloids from the A, B, and C horizons of the various types are given below. These figures represent the means of a large number of analyses.

A horizon.
$2{\cdot}13\ SiO_2\ Al_2O_3\ 2{\cdot}83\ H_2O$

B horizon.
$1{\cdot}75\ SiO_2\ Al_2O_3\ 2{\cdot}2\ H_2O$

C horizon.
$2{\cdot}37\ SiO_2\ Al_2O_3\ 2{\cdot}39\ H_2O$

When the solum proper is compared with the parent material of the C horizon, it will be seen that silica has been lost at a greater rate than alumina. This implies laterisation. However, the differences are small, and, the lateritic trend is not very definite. In some cases the converse is true, i.e., there are indications of slight podsolisation in which there is a relatively greater loss of sesquioxide than silica. Thus, the pedogenic processes within the area preserve a balance between laterisation and podsolisation; both of these reactions have affected the soils, but neither has gone to completion. The podsolised appearance is due to the down washing of the highly coloured colloid in an essentially unaltered state rather than to differential movement in favour of sesquioxide material.

The accumulation of bases in the illuvial horizon, which is a marked attribute of a true podsol, does not occur in these soils. Hydrogen is the major cation of the exchange complex in all horizons, and the degree of unsaturation is usually high. However, the illuvial horizons are more highly unsaturated than the eluvial zones and this is reflected in the decrease of pH with depth.

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* Thesis, University of Queensland (1938).

In view of the evidence of both the silica sesquioxide ratios and of the exchange capacities, it is suggested that the term ''pseudo-podsol'' is a better designation for these soils than that which is usually implied by the term podsol itself.

The clays are of the kaolinite-halloysite type, and it may be assumed that such clays are in complete agreement with the control, which the prevailing climatic conditions impose on pedogenesis in this area, viz., effective leaching throughout the year, rapid deterioration of plant residues, and slightly acid reaction of surface soils together with a minimum formation of acid humus.

The soils should be classed as Pedalfers, and of the major soil groups of the world the closest affinity is with the Red and Yellow soils of the Eastern United States. In fact, the Nambour-Woombye-Palmwoods soils have many features in common with this group, which has been described by many workers as having both lateritic and podsolic attributes.

VI. SUMMARY.

The soils described occur in the pineapple producing districts of Nambour, Woombye and Palmwoods. The chief topographical features of this area are the numerous ridges which rise some 200 to 300 feet above sea level; they are somewhat abrupt in the northern portion, but south of Woombye, more gentle slopes are encountered.

The country rock of the area is a Mesozoic sedimentary series, consisting of sandstones and interbedded shales. Igneous rocks are not of material importance. The soil formations are mainly secondary in relation to the geological features. The parent material is a red-yellow-white decomposition zone.

Eucalypt forest forms the main vegetation association of the area, but there is a occasional development of tropical rain forest.

The mean annual rainfall is 64 inches at Nambour and 65 inches at Palmwoods. A marked feature of the climate is the intense though intermittent character of the summer rainfall. In the spring, the mean monthly rainfall is less than the mean monthly evaporation, so that the agricultural value of the various soil types is determined by their moisture relationships.

The soils fall naturally into two main groups, viz.—

(1) The dark brown–red-brown soils with reddish subsoils.

(2) The shallower grey-brown soils characteristically leached in appearance, which overlie yellow-brown subsoils.

The first group has been classified as the Woombye series and comprises two soil types:—the Woombye loam and Woombye sandy loam. The soils of the grey-brown group are represented by the Palmwoods Series, Coe's Creek Series, Nambour sand and Rosemount sand. The Palmwoods Series consists of two soil types:—the Palmwoods sand and Palmwoods sandy loam, while the Coe's Creek sand and Coe's Creek sandy loam form the Coe's Creek Series. Because of its endodynamomorphic differences, the Rosemount clay loam is not included in the two major soil groups.

There is considerable variation in the textures of the surface horizons as is implied by the names given to the soil types. In general, the A horizons of the grey-brown group of soils are coarser in texture than those of the Woombye Series. The textures of the surface soils have a marked influence upon the structural characteristics. A well-defined structure is present in the Woombye loam and Rosemount clay loam, but the sandy loams and sands are structureless with the exception of the Woombye sandy loam, in which a system of incoherent aggregates occurs. Since the efficiency of water movement in the Woombye loam and Rosemount clay loam is dependent on the porosity afforded by their structural development, correct management of these soils is important.

The percentage of water retained at the moisture equivalent varies with the texture, being greatest in the heavier soils. A similar agreement exists between wilting coefficient and texture. The field capacities of the soils may be calculated from the moisture equivalent values by the application of a suitable factor. This factor has been determined for several of the soil types, and from it the "available" moisture has also been determined. Since the rainfall of the area is intermittent, the aim of cultural practices on these soils should be the maintenance of soil moisture at field capacity.

While the organic matter content of the surface horizons of both the major soil groups is generally low, the red-brown soils are usually richer in carbon and nitrogen than the grey-brown group. The carbon: nitrogen ratios of the former are also narrower than those of the latter. The greatest accumulation of organic matter occurs in the Rosemount clay loam.

The replaceable base content is not high. The average replaceable potash content is less than 0·31 m.e. per cent.: in all but two of the soil types one or more samples were found to contain less than 0·1 m.e. replaceable K. The Woombye loam contains the highest mean level of this constituent. Calcium is the major exchangeable base.

In all of the soil types the available phosphoric acid content is extremely low, all estimations being less than five parts per million.

The reaction of the majority of the surface soils lies within the range pH 5·4 to 6·2. Since this is somewhat greater than the optimum soil reaction for pineapple growth, the buffering capacities of a number of typical samples were determined. From the data obtained, the sulphur requirement of the various soil types has been tabulated.

The soils of the Nambour-Woombye-Palmwoods area are Pedalfers. Of the major soil groups of the world their closest affinity is with the Red and Yellow soils of the Eastern United States. The movement of silica and sesquioxide within the profiles indicates that pedogenesis has preserved a balance between laterisation and podsolisation; both of these processes have affected the soils, but neither has gone to completion.

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APPENDIX.

Mechanical and Chemical Analyses of Profiles.

WOOMBYE LOAM.

Lab. No.		4041	4042	4043	4044	4045
Horizon		A_1	A_2	B_1	B_2	C
Depth in inches		0–3	3–12	12–21	21–48	60–66
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Coarse sand		42·7	38·8	35·3	31·6	39·3
Fine sand		21·8	21·9	20·9	21·1	23·2
Silt		9·8	9·8	7·2	8·9	12·7
Clay		21·2	26·4	34·2	37·6	22·9
Loss acid treatment		1·0	1·3	0·9	n.d.	n.d.
Moisture		1·9	1·5	1·3	n.d.	n.d.
Soluble in HCl	R_2O_3	13·64	17·05	21·60	24·38	31·27
	Fe_2O_3	5·48	7·04	8·56	10·40	16·96
	P_2O_5	0·044	0·040	0·037	0·044	0·081
	CaO	0·21	0·133	0·091	0·056	0·140
	MgO	0·158	0·199	0·165	0·056	0·141
	K_2O	0·094	0·094	0·120	0·129	trace
Organic C		2·60	1·23	0·61	0·20	0·11
pH		5·8	5·9	5·7	5·3	5·6

WOOMBYE SANDY LOAM.

Lab. No.		4046	4047	4048	4049
Horizon		A_1	A_2	B	C
Depth in inches		0–6	6–15	15–42	54–57
		Per cent.	Per cent.	Per cent.	Per cent.
Coarse sand		52·9	48·0	47·7	49·6
Fine sand		14·8	20·3	20·8	24·0
Silt		9·6	9·9	8·4	11·2
Clay		16·4	18·2	21·3	15.2
Loss acid treatment		1·3	1·2	0·7	n.d.
Moisture		2·2	1·3	1·1	n.d.
Soluble in HCl	R_2O_3	10·17	11·97	13·17	16·35
	Fe_2O_3	4·38	4·88	6·24	9·60
	P_2O_5	0·064	0·047	0·046	0·076
	CaO	0·266	0·175	0·133	0·119
	MgO	0·291	0·266	0·150	0·393
	K_2O	0·018	0·022	0·030	0·085
Organic C		2·89	1·29	0·43	0·06
pH		6·2	6·2	6·0	6·1

PALMWOODS SANDY LOAM.

	Lab. No.	4050	4051	4052	4053
	Horizon	A$_1$	A$_2$	B$_1$	B$_2$
	Depth in inches	0–5	5–12	12–15	15–30
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	50·0	49·0	46·8	n.d.
	Fine sand	28·3	30·0	28·3	n.d.
	Silt	6·7	6·1	6·5	4·6
	Clay	11·6	11·7	15·7	30·20
	Loss acid treatment	n.d.	n.d.	n.d.	n.d.
	Moisture	n.d.	n.d.	n.d.	n.d.
Soluble in HCl	R_2O_3	5·84	6·95	8·60	16·96
	Fe_2O_3	1·76	1·76	2·20	5·16
	P_2O_5	0·025	0·020	0·011	0·019
	CaO	0·126	0·105	0·084	0·084
	MgO	0·058	0·038	0·048	0·093
	K_2O	0·069	0·106	0·069	0·301
	Organic C	2·41	1·06	0·67	0·43
	pH	5·7	5·8	5·5	5·0

PALMWOODS SAND.

	Lab. No.	4058	4059	4060	4061
	Horizon	A$_1$	A$_3$	B	C
	Depth in inches	0–3	3–12	15–36	42–48
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	53·3	51·2	51·4	72·6
	Fine sand	23·9	24·7	18·4	8·7
	Silt	7·9	4·9	10·6	9·3
	Clay	10·5	16·0	18·9	10·0
	Loss acid treatment	n.d.	n.d.	n.d.	n.d.
	Moisture	n.d.	n.d.	n.d.	n.d.
Soluble in HCl	R_2O_3	7·91	9·41	12·54	6·99
	Fe_2O_3	2·68	3·24	4·60	2·16
	P_2O_5	0·031	0·022	0·026	0·023
	CaO	0·161	0·112	0·084	0·084
	MgO	0·048	0·074	0·086	0·054
	K_2O	0·058	0·123	0·092	0·039
	Organic C	1·94	1·03	0·53	0·17
	pH	6·6	5·9	5·5	5·6

COE'S CREEK SANDY LOAM.

	Lab. No.	4054	4055	4056	4057
	Horizon	A$_1$	A$_2$	B$_1$	B$_2$
	Depth in inches	0–6	6–18	18–24	24–27
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	62·3	63·6	59·1	50·5
	Fine sand	17 8	17·2	18·0	15·3
	Silt	4·7	5·7	6·3	4·8
	Clay	9·8	10·2	14·2	25·8
	Loss acid treatment	0·9	0·8	0·9	1·8
	Moisture	1·3	1·1	0·9	0·4
Soluble in HCl	R_2O_3	6·32	7·41	9·06	14·25
	Fe_2O_3	3·04	3·24	3·84	5·28
	P_2O_5	0·036	0·042	0·038	0·044
	CaO	0·189	0·108	0·080	0·056
	MgO	0·029	0·056	0·036	0·069
	K_2O	0·053	0·110	0·169	0·237
	Organic C	2·21	1·21	0·65	0·58
	pH	6·2	6·0	5·3	4·5

COE'S CREEK SAND.

	Lab. No.	4062	4063	4064	4065
	Horizon	A_1	A_2	B_1	B_2
	Depth in inches	0–8	8–18	18–36	36–39
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	68·8	67·5	61·6	57·9
	Fine sand	15·8	20·9	19·1	19·3
	Silt	2·9	6·0	5·3	5·6
	Clay	6·2	5·3	13·1	16·4
	Loss acid treatment	1·1	0·7	0·6	0·8
	Moisture	n.d.	0·3	0·6	0·6
Soluble in HCl	R_2O_3	2·40	1·87	5·18	7·60
	Fe_2O_3	0·92	0·68	1·24	2·40
	P_2O_5	0·021	0·006	0·009	0·009
	CaO	0·112	0·045	0·035	0·042
	MgO	0·117	0·036	0·063	0·028
	K_2O	0·031	0·020	0·024	0·024
	Organic C	1·95	1·12	0·89	0·42
	pH	6·1	6·3	5·2	4·8

NAMBOUR SAND.

	Lab. No.	4066	4067	4068	4069
	Horizon	A_1	A_2	A_2	BC
	Depth in inches	0–4	4–15	15–30	30–33
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	59·5	63·2	63·9	49·7
	Fine sand	20·2	18·5	18·4	19·0
	Silt	8·1	8·8	9·2	9·5
	Clay	8·0	7·1	6·9	19·9
	Loss acid treatment	0·6	0·7	0·9	n.d.
	Moisture	1·1	0·8	0·6	n.d.
Soluble in HCl	R_2O_3	5·41	5·44	8·22	10·96
	Fe_2O_3	3·20	2·44	2·16	4·80
	P_2O_5	0·026	0·024	0·021	0·021
	CaO	0·133	0·084	0·084	0·077
	MgO	0·086	0·056	0·055	0·146
	K_2O	0·153	0·180	0·202	0·248
	Organic C	2·21	1·02	0·53	0·16
	pH	5·7	5·7	5·7	5·3

ROSEMOUNT SAND.

	Lab. No.	4074	4075	4076	4077
	Horizon	A_1	A_2	B	C
	Depth in inches	0–3	3–18	24–30	36–42
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	61·9	61·0	38·3	63·0
	Fine sand	23·8	24·6	16·8	11·6
	Silt	5·7	8·7	6·1	7·4
	Clay	5·8	5·7	35·2	14·8
	Loss acid treatment	0·8	0·6	1·0	n.d.
	Moisture	0·6	0·4	2·4	n.d.
Soluble in HCl	R_2O_3	3·31	4·53	21·47	8·90
	Fe_2O_3	2·12	2·84	10·64	4·00
	P_2O_5	0·037	0·032	0·051	0·081
	CaO	0·112	0·070	0·091	0·119
	MgO	0·098	0·086	0·231	0·130
	K_2O	0·082	0·086	0·219	0·258
	Organic C	1·55	0·46	0·29	0·29
	pH	6·1	6·3	5·6	5·1

ROSEMOUNT CLAY LOAM.

	Lab. No.	4078	4079	4080	4081
	Horizon	A	A_2	B	BC
	Depth in inches	0–3	3–12	12–15	15–18
		Per cent.	Per cent.	Per cent.	Per cent.
	Coarse sand	20·3	20·0	18·4	22·7
	Fine sand	14·4	15·7	15·6	17·0
	Silt	20·3	21·4	16·7	18·2
	Clay	32·2	35·3	47·8	37·5
	Loss acid treatment	n.d.	n.d.	n.d.	n.d.
	Moisture	n.d.	n.d.	n.d.	n.d.
Soluble in HCl	R_2O_3	19·96	21·70	25·68	25·28
	Fe_2O_3	4·28	4·32	4·58	4·86
	P_2O_5	0·077	0·048	0·050	0·020
	CaO	0·294	0·161	0·091	0·133
	MgO	0·313	0·221	0·144	0·193
	K_2O	0·091	0·039	0·089	0·039
	Organic C	5·98	3·15	3·66	n.d.
	pH	5·6	5·4	5·40	n.d.

* * *

SCIENCE AND THE SOIL.

Nowhere is the association of science and the land more clearly shown than in the work of the agricultural chemist. Every branch of agriculture owes a lot to his patient investigations.

New avenues of investigation are constantly opening. For instance, one of the recent problems was to discover or produce a variety of the lupin plant bearing seed free from poisonous alkaloid, so that it might be fed safely to stock.

The age-old problem of the cause of so-called "alkali disease" in stock was solved only in 1934, when American workers showed that this disease was caused by harmful amounts of an element—selenium—being absorbed from certain soils by plants and thus being eaten by stock. Naturally, such an important discovery could not fail to interest Australian stockowners, and investigations into the possible occurrence of this element in our native pastures were begun with, so far, reassuring results.

Mineral deficiency in pastures is under continuous investigation to the advantage of stockowners who are guided by results.

The formation of poisonous prussic acid in Sudan grass, and the conditions under which it is formed, is another of the numerous subjects of investigation by our agricultural chemists.

* * *

NOTICE TO READERS.

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The Phosphorus Problem in Western Queensland.

DR. E. HIRSCHFELD.

The publication of this paper has been authorised as a contribution to a discussion on a subject of considerable importance to Queensland stockowners.—Editor.

Summary.

1. Mineral plant foods on Bybera and further west:
    (*a*) Rich in lime ;
    (*b*) Ample in potash;
    (*c*) Deficient in phosphorus;
    Their effects on the stock.
2. Making good the deficiency of phosphorus.
3. Main economic remedy for graziers is a lick of sterilised bonemeal.
4. Experience with licks on Bybera; pitfalls in using them.
5. Additional rations of phosphorus in the form of bonemeal licks brought about the following changes in our cattle:—
    (*a*) They increased in fertility;
    (*b*) They secured earlier maturity;
    (*c*) They prolonged the life of the older cows;
    (*d*) They tided the stock over the winter months and dry spells by enabling them to make better use of the dried and savourless grasses.
6. A theory is propounded from our experience on Bybera and from other data, *that an ample supply of phosphorus to the stock acts as the activating agent (Katalysator) of reproduction, probably in conjunction with Vitamin E; thereby increasing the calving and lambing, bringing about earlier maturity and increasing their resistance to disease.*

Mineral Plant Foods in the Soil of Bybera.

Bybera is a selection in the Goondiwindi district. It consists mostly of brigalow and belah country with numerous melon-holes. At the time of our taking it over, it was practically in its virgin state, covered with thick scrub, between 800 and 1,000 trees to the acre. We ringbarked the place, and stocked it with Aberdeen-Angus cattle till the place would be ready for sheep.

It is known that the soil of Queensland, taking it as a whole, is deficient in phosphorus. This deficiency Australia shares with the rest of the world. The lack of phosphorus is said to get worse the further west we go. Knowing how indispensable phosphates are for human beings and that cattle would obey similar laws, I desired to obtain definite information as to how we stood on Bybera, not only regarding phosphates, but also other important mineral salts like lime, potash, magnesia, and iron. Confining ourselves to the brigalow and belah country, a series of samples were taken of the soil and submitted to the Agricultural

Plate 46.

HOCK-DEEP IN RICH PASTURES.—This dense sward of nutritious grasses has replaced brigalow and belah scrub on Bybera.

Chemist for analysis. I am greatly indebted to the Department for the assistance received. It was painstaking work and entailed considerable labour. I summarise the findings.

The country is very rich in lime, not only in the surface layer, but actually increases in this mineral with depth. This fact became apparent as we were taking the samples, many of the clods in the depth of the hole being covered with white films of carbonate of lime. In sinking holes and taking samples at various depths, we found that at 6 inches from the surface the amount of lime had doubled, while at 12 inches it had increased to two and a-half times the surface percentage. The explanation is probably this: Heavy falls of rain leach out the lime from the surface and wash it down into the deeper layers, where they are caught by the clayey subsoil and stored. Fortunately, most of our soils further west, as repeated analyses have shown, also carry fair to good quantities of lime, just as the soil of Bybera does. This goes a long way to build up the framework and constitution of the stock grazing upon these pastures, and explains why cattle and sheep coming from the West enjoy such a high reputation for being big in frame and sound in constitution. Pastures rich in calcium, moreover, are likely to breed stock free from tuberculosis. We ought not to hide our light underneath a bushel, and should make it known to the world that, both on account of the open-air grazing and the wealth of lime in our soil, our cattle are less subject to tuberculosis.

Lime plays an important part in the production of milk. As the skeleton of a calf is built up in the short space of the first nine to twelve months, cow's milk carries a high percentage of calcium and phosphates—much higher than human milk. Hence this factor is also in our favour.

Regarding potash, the analyses returned a very fair and even amount throughout the first 12 inches of soil—enough for all our requirements for many years to come. The returns from further west, as far as analyses have been made, are also most satisfactory. In the Mitchell district the potash content of the soil runs up to twice the amount found on Bybera.

Potash is an important mineral food—more particularly for the sheepman. A full-grown wether with 10 lb. of wool on its back has in the neighbourhood of ¾ lb. of potash in his wool. When we send these millions of pounds of wool abroad, we send at the same time between one-tenth and one-fifteenth its weight of potash out of the country. The high potash content of the western downs is probably one of the reasons why the wool grown there is of such excellent quality. Fruit is rich in potash, and therefore requires plenty of it in the soil. All animals feeding on grasses consume much potash—at any rate, more than their constitution stands in need of; hence they are all ravenous for salt. The sodium in the salt pushes the excess of potash out of the body fluids and restores the balance.

The Phosphorus in the Soil.

The report of the Chemist was not equally heartening concerning the phosphorus content of the soil on Bybera. There is a distinct deficiency of phosphorus. One remarkable fact stood out: While most of the lime was found in the deeper layers of the soil, most of the phosphorus was in the top layer—the first 3 or 5 inches. This is rather a serious matter. The surface, of course, is that part most liable to erosion. As Bybera is fairly level country, erosion by running water is not to be feared; but erosion by wind during a prolonged dry spell is a factor to be reckoned with. When the surface becomes bare, as the grasses die off in a drought, some of the scanty stock of phosphorus is liable to go with the wind; the same applies even more so to the western plains. In Mitchell grass country the clumps of Mitchell grass grow widely apart, leaving fair-sized patches between them, where, even in a good season, let alone in a drought, the wind plays havoc with the surface. Most of the phosphorus of the green plant is gathered in the seed; the seed falls to the ground; hence the enrichment in phosphorus of the surface layer. Dr. M. White, with whom I discussed this matter, suggested this explanation, with which I agree.

Plate 47.

A BRIGALOW GROVE RESERVED AS SHADE FOR STOCK ON BYBERA.

One of the best returns was from a sample taken at the bottom of a melon-hole. Evidently dead leaves and eroded particles of soil had settled there and enriched it. The opinion of the Chemist was endorsed by the cattle—they preferred to drink the stagnating water of the melon-holes rather than the pure water of the running stream. Their instinct sought out the place rich in mineral plant foods. Unfortunately, the lower half of the melon-holes is bare of grasses, only reeds growing there; so the stock left those places alone during dry weather. We rather prided ourselves in outwitting nature; by systematically planting water-couch in the muddy soil just as the water dried off, we have managed to get a stand with the grass which thrives there.

Plate 48.
BRIGALOW COUNTRY IN ITS NATURAL STATE.

The deficiency of phosphorus is found not only all over Australia, but throughout the rest of the world. Wherever crops are grown the deficiency has to be made good by adding superphosphates. A grain crop takes heavy toll of the phosphorus in the soil, as grains are particularly rich in it. It has been computed that one crop of maize takes ninety times as much of phosphorus out of the soil as a year's grazing does. Maize is, of course, taken off the property, while about three-quarters of the grass eaten by stock is returned to the land in the form of manure. Nevertheless, we have to reckon with the fact that a marked deficiency has already made itself felt.

Making Good the Deficiency of Phosphorus.

The obvious remedy for a deficiency of phosphorus in the soil is to add superphosphates. The farmer with a small acreage would be immediately rewarded by an increased yield. But it is not feasible for the grazier. A ton of superphosphates costs at present £6 16s.; landed on Bybera, the cost would exceed £8; spreading it at the rate of 1 cwt. per acre means spending 8s. on each acre. Where the land is held on lease, no allowance for the expenditure would be made to the outgoing tenant. It is out of question, except for special purposes.

When the soil does not supply sufficient phosphorus, we have to give it to the grazing beast in the form of licks. That does not benefit the soil directly, but it does the beast. Whatever passes through the animal without being absorbed is dropped on to the soil; so the latter gets a small share of the benefit. It might be objected: Why not wait till the cattle show distinct signs of the deficiency? Long before a symptom stands out obvious to everybody, the beast may be suffering in health without any other sign except that it does not look so well, fails to put on enough flesh, that its coat is not so glossy, and becomes affected with worms. A disease is like the root of a grass—it is not noticed till it comes above the surface. *When the conditions for disease exist, it is good sense to act before you are forced to, and anticipate the disease.*

Plate 49.

FROM DENSE SCRUB TO SWEET PASTURE.—A well-grassed paddock on Bybera.

On Licks.

All advertisements are loud on what they want you to buy and silent on what you really ought to buy. The whole truth is not always found in advertisements. Whatever portion of truth they contain is often made use of to season the claims which are not justified. The Department of Agriculture has issued a most valuable report on seeds, stock foods, fertilizers, &c., which ought to be in the hands of all men on the land. It sets forth the composition as declared by the seller, and gives side by side the figures as guaranteed by the seller. In this way the honest merchant is protected and the buyer enlightened as to what he pays his money for.

In choosing a lick for our requirements, it was obvious that one richest in phosphates would suit us best. From my experience as a physican, however, I knew that what mattered was not what I prescribed, but what is absorbed by the patient. Many inorganic lime and phosphate salts, when taken, pass almost wholly through stomach and bowels without benefiting the patient; the system was not able to extract the phosphorus, given with the best intentions. I thought I'd follow the lead given to us by the cattle themselves. When bullocks are on pastures poor in phosphorus and lime, they start to chew bones. Fortunately, our pastures in Queensland have not yet come to the pass that has made bone-chewing a widespread disease in South Africa, although in the North-West—in the Cloncurry district—it has made its appearance during the drought. Bones are rich in mineral salts—more than four-fifths of the whole of the ash of a body is found in the bones—and they contain phosphate and lime salts in a combination which obviously must suit their constitution. For this reason, I chose *ground bone meal*. Dr. Montgomery White, an adviser of the Department of Agriculture, placed a small quantity of "Calphos" at my disposal. This "Calphos" was manufactured under his supervision at the abattoir. Dr. White was good enough to supply me with the following analysis:—

	Per cent.		Per cent.
Water at 105	6·2	Phosphoric acid	25·24
Organic material	28·98	Chlorine	0·21
Nitrogen	3·94	Sulphur	0·05
Fat	2·98	Iron and aluminium	1·14
Inorganic material	64·82	Magnesium	1·05
Calcium oxide	32·48	Potash	1·65

Readers will wonder why I selected a preparation which contained so much calcium although our soil is so rich in lime; surely that seemed spending money on something that was unnecessary! The answer is: The bulk of the phosphorus in the body is found in the form of salts in the combination, mainly with lime and a little with magnesia and other elements. As my object was to offer the phosphorus in such a combination as occurs in the body and therefore would be acceptable to the body, I had to take the lime into the bargain.

The high amount of organic material—29 per cent.—is useful to the stock, inasmuch as it supplies flesh-forming substance. It had not been artificially added to the "Calphos," but resulted from the treatment of the bones. The disadvantage of the admixture of the organic matter is that it makes it liable to decomposition and decay, if wet. The low content of water—6 per cent.—makes it safe while being kept; but when being exposed to the weather in open troughs, that is a different matter. In order to guard against this risk, my son (R. S. Hirschfeld) constructed the troughs in such a way as to be fairly sheltered against the weather. Nevertheless, the moisture which comes from the saliva of the bullock as he licks the "Calphos" seemed to me to be a risk; but it did not prove so in reality. No decay was found in any of the material. The mixing of the "Calphos" with salt evidently acted as a preservative. I dwelt on this point perhaps too strongly, but, being used in my profession to aseptic and antiseptic precautions, it seemed to me to be more important than it proved in practice.

Well, we exposed the lick in its troughs; we had made our preparations, but the cattle thought otherwise—they looked at it, but would not take to it, although it was close to the water-troughs where they were watering. It seemed to be one of our mistakes. I consulted the authorities in Brisbane. They advised me to make the lick more palatable by adding molasses. I did not like the idea; if they stood in need of it, they would take to it as they take to chewing bones, even with adhering decayed flesh. Bribing their palate seemed to me spoiling the experiment. Cattle are curious by nature; they try everything once. Moreover, my son strongly objected to molasses—"We shall have all the flies in the Goondiwindi district around our waterholes." So we left the calphos-troughs and the cattle alone. Several months elapsed and the winter came on. With the colder weather a change came over the stock; they started to pay visits to the licks, and after a while the troughs were actually licked clean, and their contents had to be renewed. How strong the need of the stock was during the winter months for the phosphate lick was proved by the following incident:—We had run out of the lick for a couple of weeks, when a new supply arrived on the selection. I was present on the place as the troughs were being filled with the new material. The cattle were watering at the nearby bore. They watched us filling the troughs, and a cloud of dust arose as we were mixing the salt with the bonemeal; they sniffed the dust, but did not come near while we were there. As we rode away, there was a scramble for the troughs; it reminded one of the rush for a bargain sale in a drapery store.

What was the reason for the cattle keeping away from the licks during the summer months? An analysis of the young brigalow grass which I took to Mr. Gurney supplied the answer. The green shoots showed a high content of phosphorus. With the early spring rains much of the available phosphorus in the soil goes into solution and feeds the roots of the grasses; the roots convey it to the plants, and the cattle obtain a liberal supply of phosphorus in a natural and palatable form. This continues right through the summer while the soil is moist. The brigalow grass particularly is a bounteous and frequent seeder all through the summer months, and so are other grasses to a smaller extent. Consequently, there is no lack of phosphates during that time. But the pastures lose their phosphates as soon as the seeds are shed, for between half and three-quarters of the plant phosphorus collects in the seeds. With the coming of autumn the grasses begin to dry off. As a rule, we are not favoured with winter rains in Queensland; the grasses lose most of their nourishment and only supply bulk, with the exception of the brigalow grass, which always carries some green shoots amongst the dried-up stalks. Unless there have been good rains late in the summer, there will be but a scanty growth of herbage, and green feed is scarce in the winter. That's the time when the cattle turn to the troughs with the licks. All dry spells that use up the moisture in the soil lead to a lack of phosphorus in the natural fodder. Often even in a severe drought some dry feed can still be picked up in the paddock. That is the time when the phosphate lick will supply the seasoning that enables the stock to make use of whatever dried feed remains. From our own experience, I feel convinced that the phosphate lick will lessen losses of stock during droughts and keep the surviving stock in somewhat better condition.

All stock in Queensland need an additional supply of phosphorus during the winter and dry spells.

Now to the economic side. One ton of "Calphos" costs £9 10s.; one ton of coarse salt is £5 4s. The railage to Inglewood (252 miles) on both is in the neighbourhood of £5. That quantity will last a long time. As the frame of sheep is more slender than that of cattle, they need less of the lick in proportion. It is not wise to mix too much salt into the lick for sheep, especially young sheep.

Plate 50.
SHELTERED LICK TROUGH IN A BYBERA PADDOCK.

Effect of the Lick on Our Herd.

When we started to give the lick to our stock, we had no intention of conducting the experiment on strictly scientific lines, as it would have been on an animal health station, where rations are weighed out, the animals themselves being weighed at regular intervals and control animals watched. We have to rely on the judgment of the man who is in daily contact with his pastures and cattle.

The following facts stand out:—

1. The fertility of the cows has been increasing since we have been using the licks. At the muster this year we had a percentage of between 80 and 90 weaners. We do not ascribe the whole of this high percentage to the licks. The continued improvement of the pastures, the quality and number of the bulls employed, and a fair season—though not unusually so—have been important factors. But the greed with which the cattle consumed the lick in winter time has been impressive, and the percentage of calves unusually high. When taken in combination with other observations, the share of licks in bringing about such a high fertility becomes more conspicuous.

2. Improved condition of the stock during the winter. A dry winter is a severe testing time for pastures and management; our winters are very cold—15 to 17 degrees of frost are not unusual—and the rainfall scanty. There could be no doubt about the increased zest with which the stock tackled the dry feed in the paddocks since we introduced the lick. The house cows in the horse paddock, without additional feeding, continue to give milk.

3. Increased longevity of the old cows. Wo do not spey and fatten our old cows, but allow them to go on breeding, as one or two additional calves repays us. The lick gives them increased resistance against cold and dry spells, and enables them to survive on the savourless grass till the spring puts new life into them.

Plate 51.
A Favourite Rendezvous for Cattle.—One of the cheaply-built shelters for stock licks on Bybera.

4. Earlier maturity of the stock has been an outstanding effect of the licks. This is reflected in the high prices we obtain for our weaners. In March last we sent a consignment of thirty-eight steers, mostly two years old, to the Cannon Hill saleyards and realised an average of £11 2s. 4d. This earlier maturity of the steers is on all-fours with the effect of phosphorus on plant-growth. "An adequate supply of phosphorus promotes rapid plant-growth, early maturing, hastens fruiting, and improves quality. Low supply of phosphorus leads to poor plant-growth and delayed maturity."

Phosphorus and Fertility.

Of outstanding importance to all breeders of cattle and sheep is the role which phosphorus plays in promoting fertility. It may mean a huge increase in our national wealth. Anyone can understand why phosphates build up a sound constitution and mature the beast earlier, for phosphate of lime is the main substance of which bone consists; a good framework is as necessary to the bullock and sheep as strong joists and uprights are in a house. But the influence on fertility is not so easy to understand.

A grown man has a little more than 3 lb. of phosphates in his body. Nearly nine-tenths of that amount is found in the bones; but there is phosphorus in every cell of every organ. The nucleus of the cell is the vital part of the cell, which is concerned with reproduction. Phosphoric acid and protein substances build up the nucleus. The bones, however, are the main storehouse of the phosphates. These phosphates are not immobilised in the bone, but merely stored; from the bones phosphorus is sent to any part of the body that needs it. As soon as the cow is in calf, she begins to need phosphorus for the building-up of her calf, but the demand becomes greatest in the latter months of the pregnancy. The increased demand is met by increased feeding. A time comes, however, when the pasture grasses are not able to supply the whole of the demand. Now the bones start to send out supplies of phosphorus; the skeleton of the calf is built up, if there is need for it, from the bones of the mother. The less phosphorus there is in the grasses the earlier and the greater the drain upon the bones; this drain continues after the calf is born, as the milk is rich in phosphates. This drain may become ultimately so great that the bones part with most of their mineral salts, till softening of the bones takes place. Some time before they lose the last ounce of their phosphates, nature steps in—their milk dries up, and the drain stops. But while the phosphates are needed for the calf all other organs supplied by the bones must go short and all the cells of the body function as poorly as a badly greased motor-car. The nuclei of the cells suffer most; the short supply of phosphorus, needed elsewhere, interferes with the chief function of the nuclei of all organs—reproduction. Hence the infertility.

That fertility suffers when there is not sufficient phosphorus at hand has been mentioned by Dr. A. W. Turner, of the Council for Scientific and Industrial Research. He was investigating the peg-leg disease in cattle in the Cloncurry and Charters Towers districts, and his investigation into and description of this disease is classical. He summarises his findings thus:—

> "Peg-leg is a disease of cattle in North Queensland, characterised by under-development, *relative infertility,* lameness, and various skeletal deformities. *It is most common in pregnant and lactating females.* It is due to a deficiency of phosphorus in the soil and herbage."

Compare with that the 85 per cent. fertility of the Bybera cows, where the lack of phosphorus had been anticipated! The post-mortem examinations made by Dr. Turner give conclusive proof of how the infertility arose: *"The ovaries were small and generally contain many small follicles, but there was a very low degree of ovulation." This bears out the contention that the organs of reproduction cannot function satisfactorily when there is an insufficient supply of phosphorus, without which ovulation does not take place normally.*

There are, however, many positive proofs of how intimately fertility is associated with phosphorus.

The grain of wheat represents the future plant. It is the main source of Vitamin E, which is the vitamin responsible for reproduction.

Is it a pure coincidence that a vast amount of phosphorus is massed in the grain? As a matter of fact, there is more phosphorus in the seed than there is embryonic tissue.

Let me give you another instance. The yolk of the egg is the embryonic fowl. The ash of the yolk consists two-thirds of phosphorus, while the white of the egg has only one-twenty-fifth of phosphorus in its ash.

The ash of the semen of man is three-quarters phosphate of lime; similarly, the roe of the sturgeon and of other fish, as far as they have been examined, abound in phosphorus.

There is no need to multiply instances. *Everywhere, in the animal and plant world, phosphorus is intimately associated with reproduction. Without phosphorus or with a deficient supply of phosphorus, reproduction is interfered with,* as Dr. Turner's researches and the above explanations have shown. With an ample supply of phosphorus, as proved by our experience on Bybera, there is a marked increase in reproduction.

We are driven to the conclusion that phosphorus is the katalysator—i.e., the activating agent of reproduction—in the grain of wheat as well as in the bullock. It probably acts in combination with Vitamin E. Other points remain yet to be settled. The phosphorus always occurs mainly in combination with calcium, and in a lesser degree with magnesia and potash and some other elements; but as they are amply supplied by our soil, they cannot play the decisive role. *Phosphorus is the indispensable element in reproduction.*

More phosphorus, where the soil does not supply enough of it, means more lambing and calving. It may add hundreds of thousand of pounds to our national wealth.

CATTLE FATTENING.

There are large tracts of well-grassed land in South-eastern Queensland on which fattening of bought store cattle is practised. These cattle are usually animals which fatten into ''heavies.'' Older stock can ''handle'' roughage much better than yearlings, and it takes less time and trouble to get them ready for market; but, in general, they do not give as good a net return as ''baby beef.''

The reasons are:—

(1) Buying of stores is a more speculative business and the outlay greater.
(2) Disease, drought, and other retarding influences make the money loss, if any, greater.
(3) The trade does not favour ''heavies.''
(4) Although the relative cost per 100 lb. is higher with the ''young stuff,'' more can be bought for the same money.
(5) The young animal lays on both flesh and fat—i.e., it fattens while it grows.
(6) The trade pays more for the finished carcass.
(7) There is *always* a market for well-finished lightweights.

There are certain requisites for turning off baby beeves the year round:—

(1) On the part of the buyer, a sound knowledge of what ''good doers'' look like.
(2) On the property—well-planned subdivision, improved pastures, cultivation, and fodder conservation.

Improvements require a considerable outlay of capital, but in all cases where management has been sound the returns have made it well worth while.

It should always be remembered that the improvements are permanent, and that they enhance the value of the property.

The Brisbane Exhibition.

THIS year's Royal Show was a great display of Queensland's industrial virility and progress, and a grand array of the State's resources and the result of their development.

Many problems of production and marketing have been caused by the war, and many more problems are likely to arise from it. The restriction of our sea-borne trade is one factor which will bring home to us all the economic aspects of the struggle; and, although some inconvenience and hardship may have to be endured, it will be recognised that this is only part of the price of ultimate victory. Yet, the war has presented both a challenge and an opportunity. Our capacity to take up the challenge and make most of the opportunity could not have been demonstrated more impressively than it was last month on the Brisbane Showground.

The Brisbane Show is a fountain of constructive ideas. It is, too, an educational influence, or, rather, institution, and there is no doubt of its value as a factor in the progress of the State.

The Show this year was proof of the attainment of high standards in every branch of husbandry, a demonstration of the importance of sound principles in alliance with applied science in farming practice, and an example of the linking of town and country in interest and in industry. Moreover, it was striking evidence of the energy, skill, ability, and organising powers of the people who are doing the real work of the nation.

The Court of the Department of Agriculture and Stock was among the big pavilion displays. The Department, after all, is really the farmers' own department, so producers generally are invited to take full advantage of every service it has to offer. In these days it is more necessary than ever to apply technical knowledge to farm practice in every possible way. In the interests of Australian trade it is most important that we should attain and maintain the highest possible standard of quality in all our products, especially those which we have to export. The trained officers of the Department are out to give assistance to rural industry whenever and wherever they can. Quality in every farm activity, quality in every product, raw or manufactured, is what is going to strenghen our hold on the world's markets—especially in the post-war period of economic readjustment. That, in the main, was the lesson conveyed by the Agricultural Court.

The Meat Industry Hall, the Hall of Dairying, and the Hall of Sugar provided concrete evidence of what can be done in the way of quality production through applied technical efficiency. In recent years our interests have widened vastly, and as an educative force the Royal National Association has spread its own interests accordingly. Agricultural advancement is, naturally, its first and most important consideration. This is as it should be, but in its annual pageant of Queensland manufactures and the skill of Queensland workers, the Association gives fitting recognition of the wisdom of bringing town and country together, and so demonstrating the interdependence and the interrelationship of urban and rural enterprise.

The daily stock parade at the Exhibition was one of the most obvious examples of its educational value. In the ring, the breeder's skill in combining high production with constitutional vigour was made manifest in every entry.

Generally, the Exhibition confirmed the fact convincingly that better farming and better ways of feeding stock bring greater satisfaction personally and higher returns materially. Every section provided examples of the common sense of intelligent co-operation which, applied completely, lightens the common task, ensures the common good, and adds immeasurably to the common wealth.

Plate 52.

HIS EXCELLENCY THE GOVERNOR OF QUEENSLAND, THE RIGHT HON. SIR LESLIE ORME WILSON DECLARING THE 1940 SHOW OPEN.

Plate 53.

THE CHURCH AND THE AIR FORCE WERE WORTHILY REPRESENTED AT THE SHOW.

Left.—His Grace Archbishop Wand. *Right.*—His Grace Archbishop Duhig.

Plate 54.

THE GRAND PARADE, A POPULAR DAILY EVENT AT THE BRISBANE EXHIBITION.

Plate 55.

The Navy, the Army, and the Air Force were Fitly Represented in the Guard of Honour.

SOUTH COAST & TABLELANDS

Plate 56.

THE WINNING "A" GRADE DISTRICT EXHIBIT.

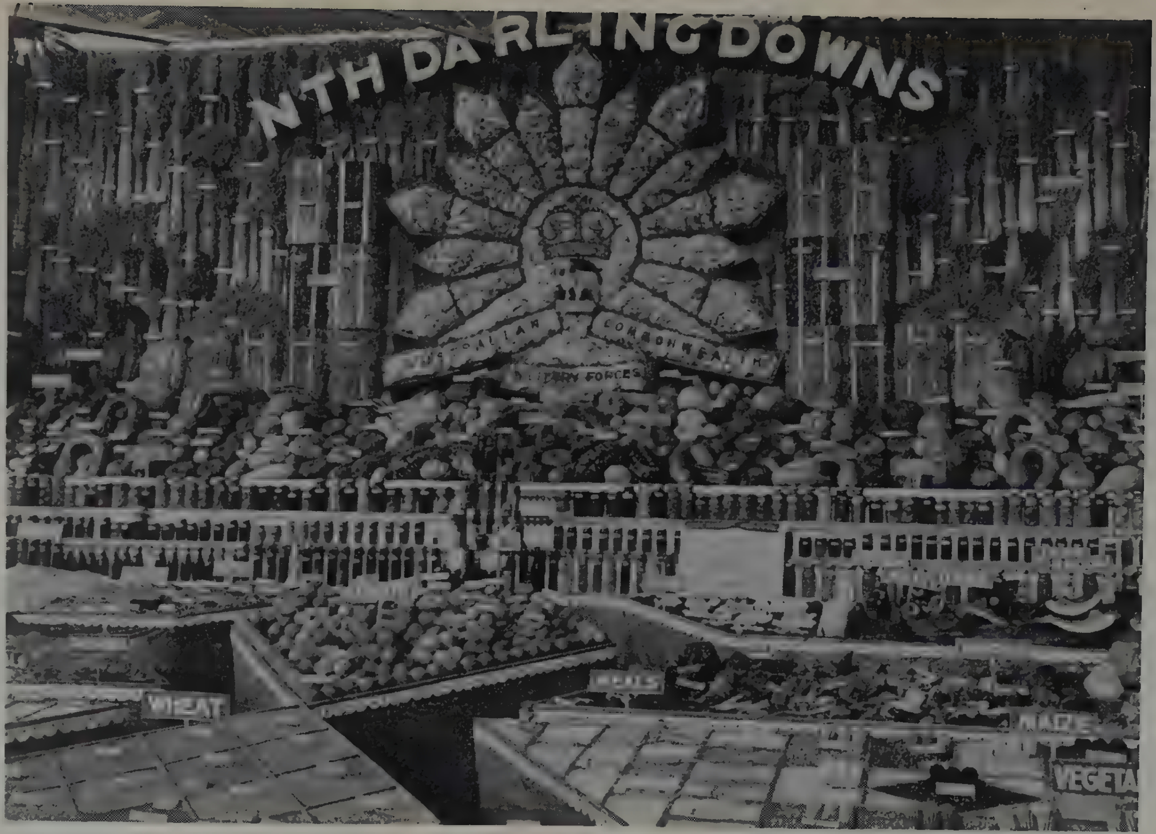
NTH DARLING DOWNS
AUSTRALIAN
COMMONWEALTH
MILITARY FORCES
WHEAT
MAIZE
VEGETA

Plate 57.
The Winning "B" Grade District Exhibit,

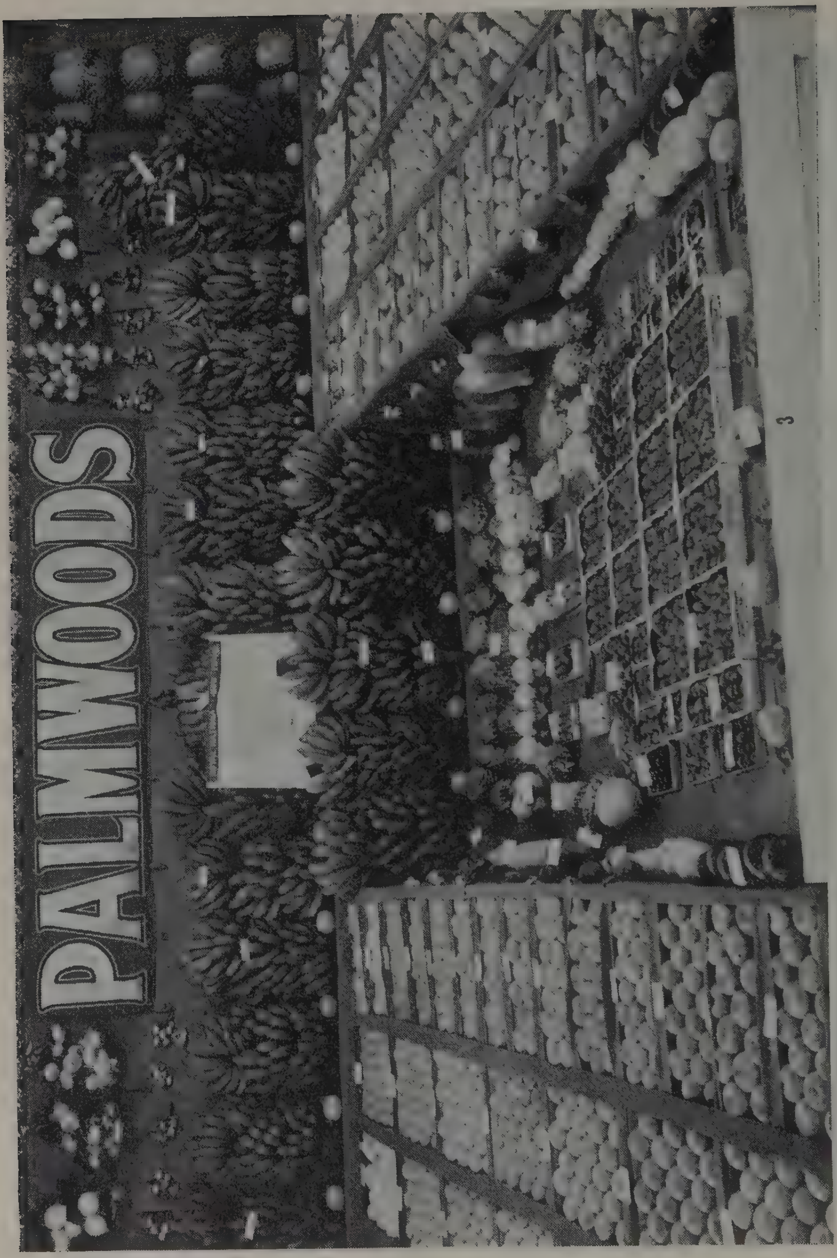
PALMWOODS
3

Plate 58.
THE WINNING DISTRICT FRUIT DISPLAY.

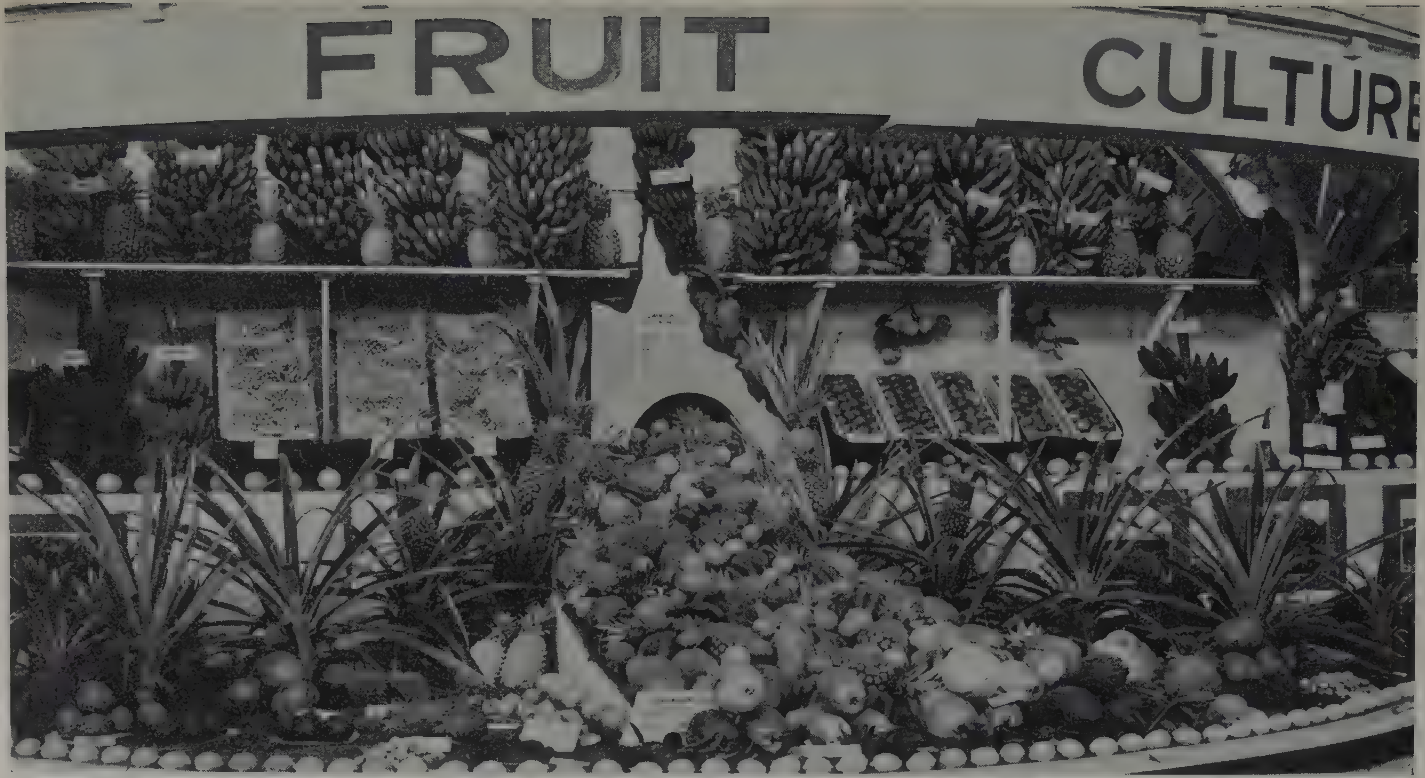

Plate 59.

Products of a Fruitful Land.—In this exhibit, officers of the Fruit Branch demonstrated the extraordinary range and richness of Queensland's orchard lands in both temperate and tropical regions.

COTTON GROWING
Australia Needs Raw Cotton
· THE CONSUMPTION OF RAW COTTON IN THIS COUNTRY GREATLY EXCEEDS PRODUCTION,
· FARMERS WITH SOILS SUITABLE FOR SATISFACTORY COTTON GROWING SHOULD THEREFORE PLANT AS MUCH ACREAGE OF COTTON THEY CAN PROPERLY CULTIVATE……
CULTIVATION COSTS
ROTATE YOUR CROPS WITH GRASSLAND IT LESSENS CULTIVATION…
THINNING COTTON
COTTON BREEDING
SEED SUPPLIES

Plate 60.

COTTON FOR THE COMMONWEALTH.—Officers of the Cotton Branch of the Department arranged this excellent exhibit of Queensland cotton and crop derivatives. The cotton-grower has an assured market and a guaranteed price. Farmers with suitable soils are urged to plant as big an acreage of cotton as they can properly cultivate.

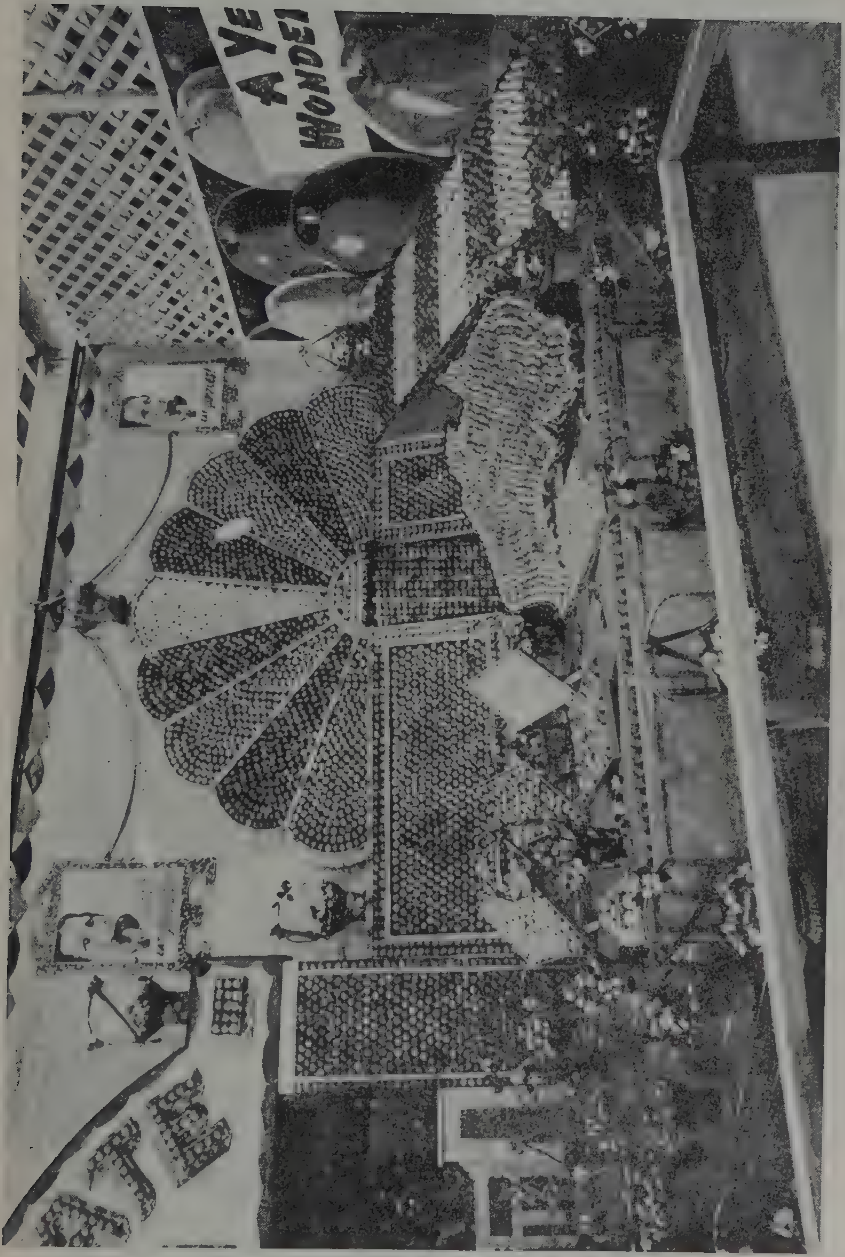

Plate 61.

Apple and Pear Varieties in Colourful Contrast.

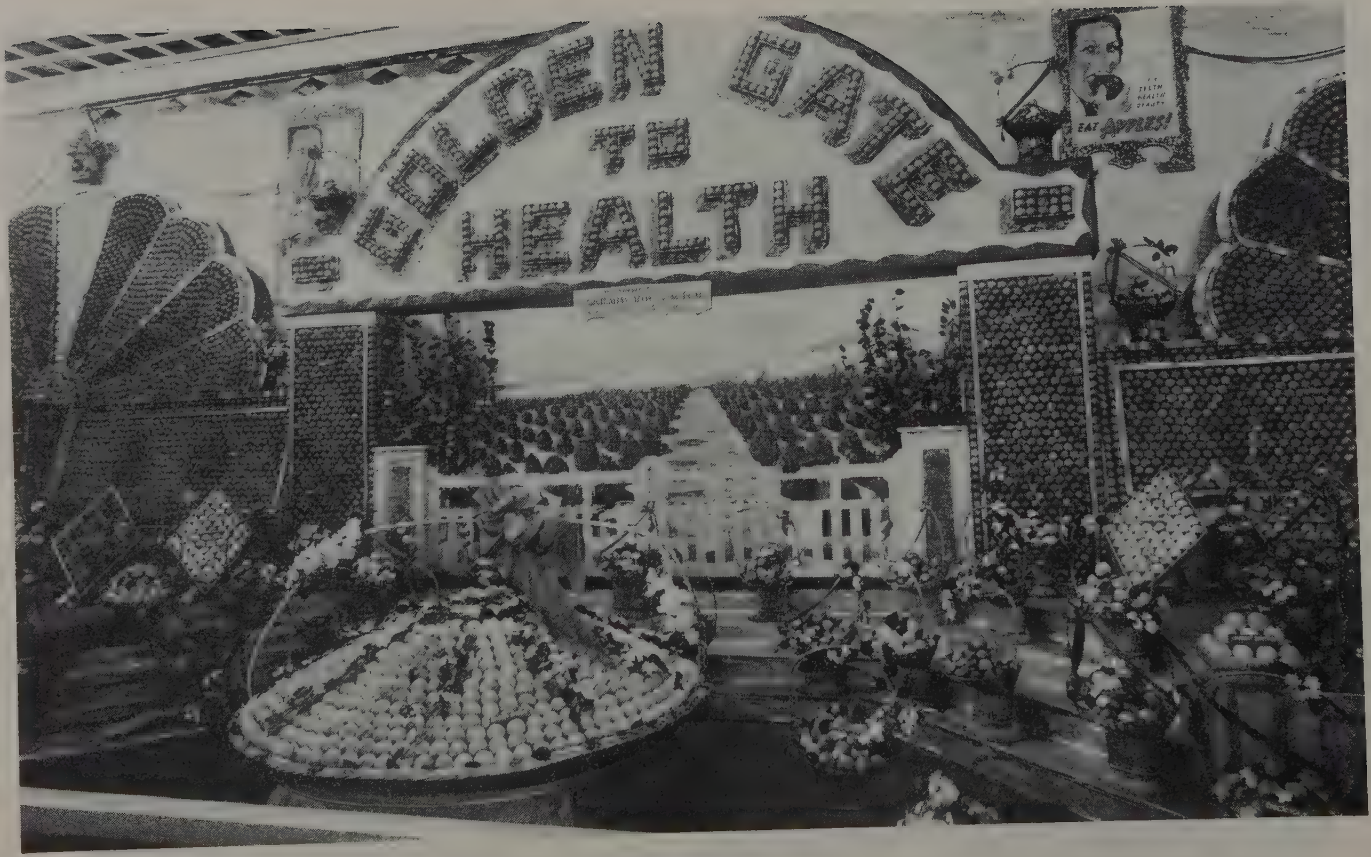
GOLDEN GATE TO HEALTH
EAT APPLES!

Plate 62.
THE DISPLAY ARRANGED BY THE AUSTRALIAN APPLE AND PEAR BOARD.

Plate 63.
A Troop of Queensland Mounted Police—The Governor's Escort.

Plate 64.

The Wealth of Western Pastures.—Wool, greasy-grey from the shears and snow-white from the scour, piled high in fleecy billows in an alcove in the Court of Agriculture. The sheep-breeding industry supplies one-half of Australia's aggregate annual exports. One of the best ways of serving the nation is to wear more wool.

Stock Disease.
A Healthy Animal is an asset;
A Diseased Animal is a liability.
ACTINOMYCOSIS
TUBERCULOSIS
CONTAGIOUS PLEURO PNEUMONIA
(PLEURO)
Director, Animal Health Station, Yeerongpilly
Control of worms in sheep.
Measures Against Tick Fevers.

Plate 65.

HOW ANIMAL HEALTH IS PRESERVED.—Queensland is one of the healthiest of stock countries, and this exhibit by the veterinary staffs of the Animal Health Stations showed how the flocks and herds of the State are protected

DAIRY HYGIENE
HIGH QUALITY MILK
QUICK TRANSPORT
COOLING
STEAM STERILISATION
CLEANLINESS IN DAIRY
HEALTHY · WELL FED · COWS
COOL MILK AND CREAM

Plate 66.

HEALTH AND WEALTH IN THE DAIRY.—The central feature of this display by the officers of the Dairy Branch was a model of a Bundaberg Dairy—a material expression of Departmental maxims in dairy practice.

Last year Queensland's dairy production added £10,000,000 to the national income. Co-operation among farmers, factory staffs, and Departmental officers was the chief factor in this achievement.

Plate 67.

IRRIGATION IN THE ORCHARD.—This section of the Fruit Exhibit in the Departmental Court showed how the overhead sprinkler system of watering works effectively.

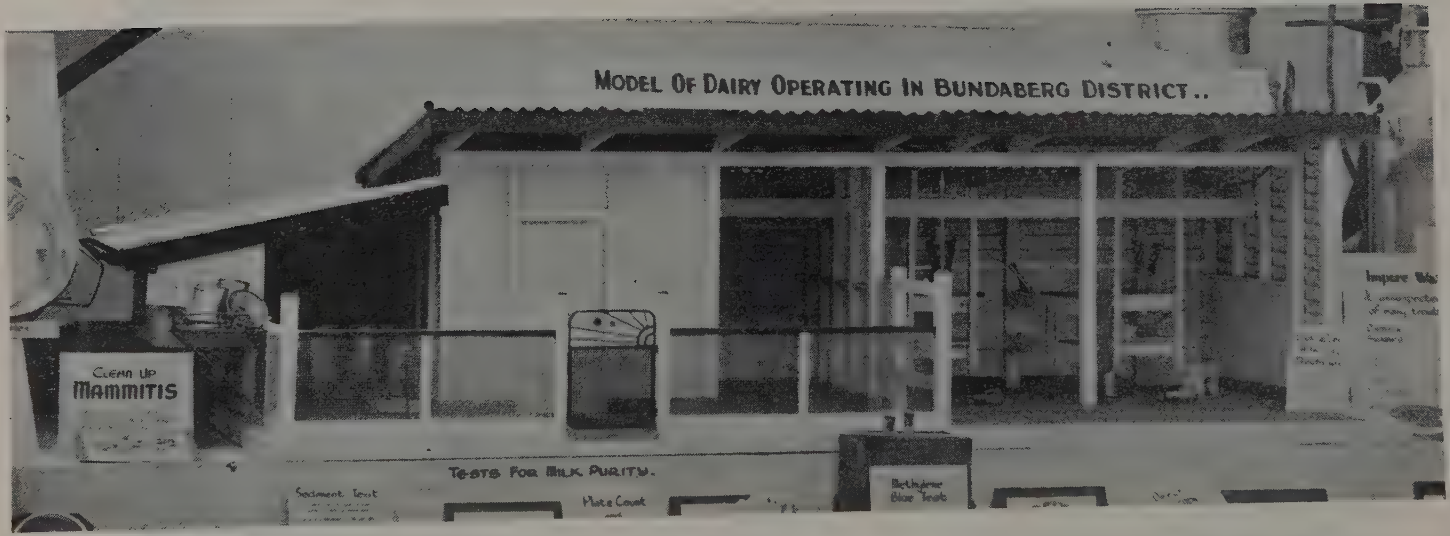
MODEL OF DAIRY OPERATING IN BUNDABERG DISTRICT..
CLEAN UP MAMMITIS
TESTS FOR MILK PURITY.
Sediment Test
Plate Count
Methylene Blue Test

Plate 68.

A Dairy "Ideal."—This model attracted much attention and stimulated resolutions to "go even one better." Among the interesting gadgets is the draining rack on the left, with a woven-wire "platform" ensuring airing of the upturned utensils placed on it to dry.

Plate 69.

Cereals in Sheaf and Grain.—This fine display was a demonstration of the skill of Departmental plant breeders and the productivity of Queensland's great grain lands. Last season's wheat harvest, aggregating nearly 7,000,000 bushels of good-quality grain, was the highest State yield yet recorded.

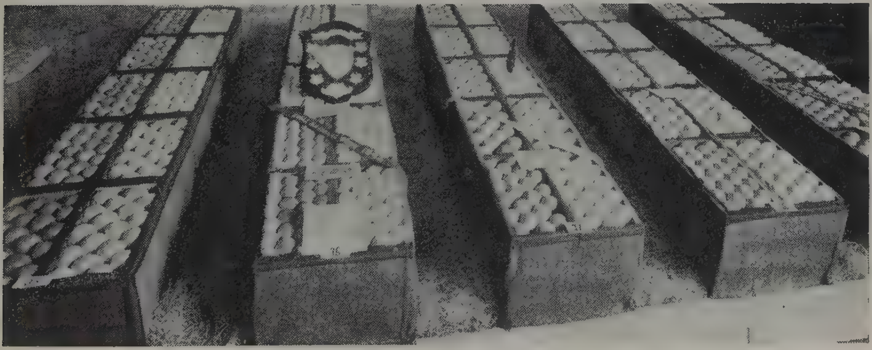

Plate 70.

A Section of the School Project Club Fruit-packing Display.

TROPIC
DECIDUOUS
FRUITS

Plate 71.

This Pyramid of Pineapples was a Winning Exhibit.

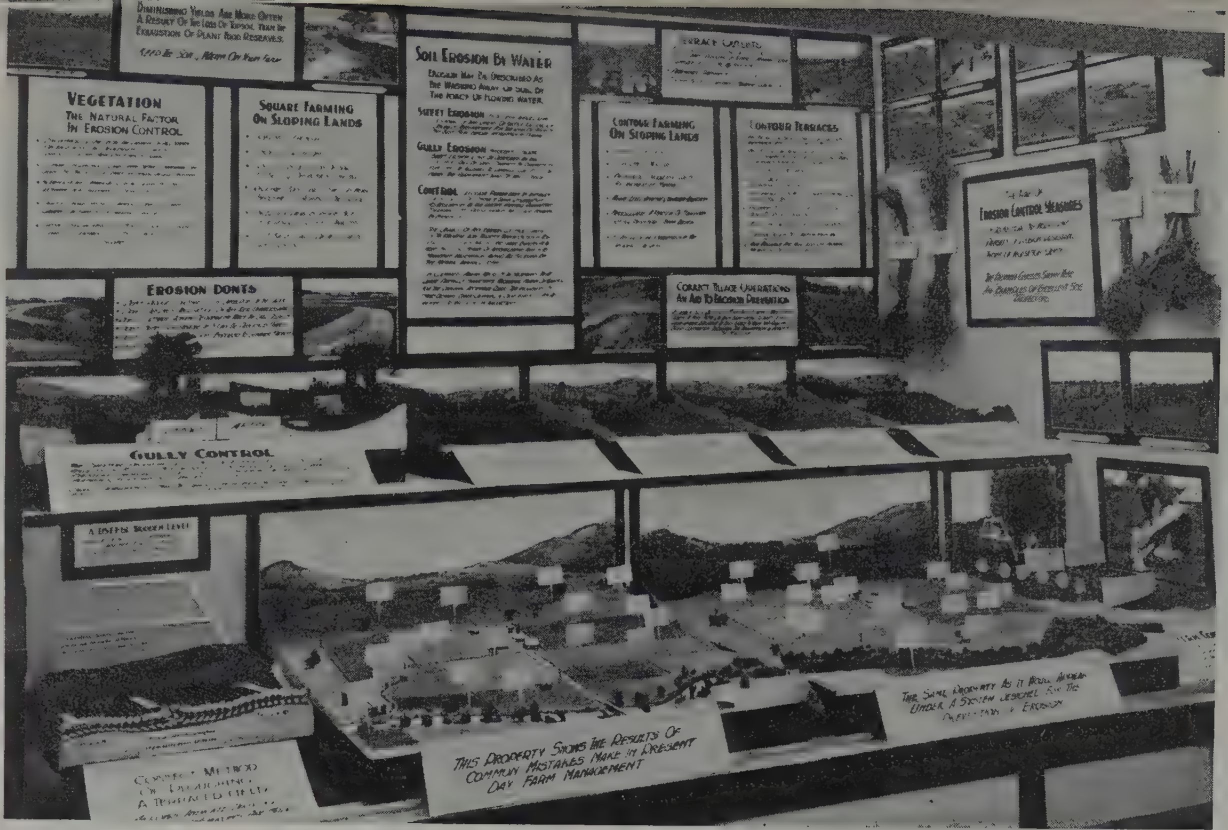
Diminishing Yields Are More Often A Result Of The Loss Of Topsoil Than By Exhaustion Of Plant Food Reserves.
Vegetation
The Natural Factor In Erosion Control
Square Farming On Sloping Lands
Soil Erosion By Water
Sheet Erosion
Gully Erosion
Control
Terrace Outlets
Contour Farming On Sloping Lands
Contour Terraces
Erosion Control Measures
Erosion Donts
Correct Tillage Operations An Aid To Erosion Prevention
Gully Control
A Useful Wooden Level
This Property Shows The Results Of Common Mistakes Made In Present Day Farm Management
The Same Property As It Would Appear Under A System Designed For The Prevention Of Erosion
Correct Method Of Draining A Terraced Field

Plate 72.

Agriculture's S.O.S.—''Save our Soil'' methods were strikingly demonstrated in this exhibit by the field officers of the Agricultural Branch.

Soil conservation by correct cultivation and prevention of wind and water erosion is one of the major interests of the Department of Agriculture and Stock.

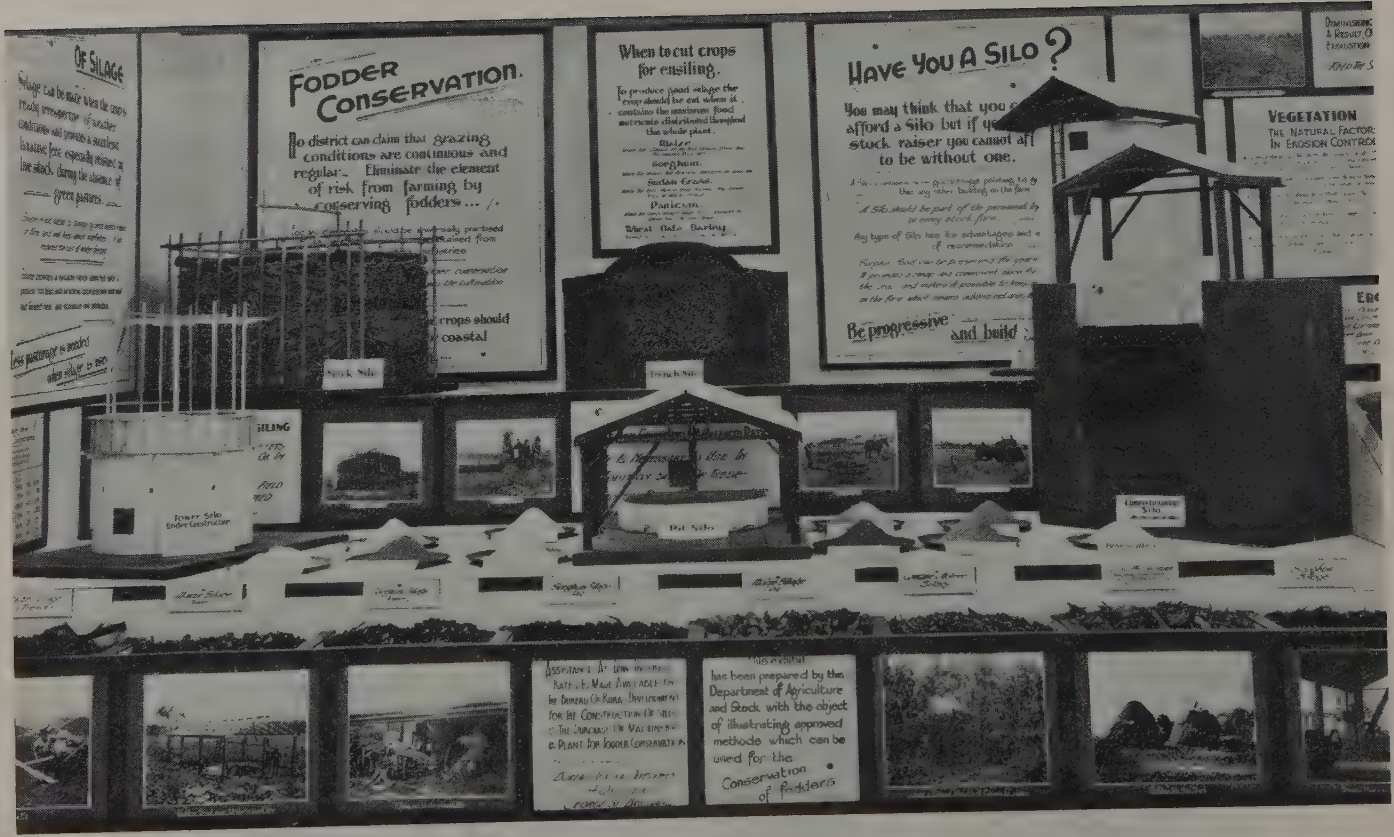
Of Silage
Fodder Conservation.
No district can claim that grazing conditions are continuous and regular. Eliminate the element of risk from farming by conserving fodders ...
When to cut crops for ensiling.
Have You A Silo?
You may think that you c[an't] afford a Silo but if y[ou are a] stock raiser you cannot af[ford] to be without one.
Be progressive and build
Vegetation
The Natural Factor In Erosion Control
Stack Silo
Trench Silo
Pit Silo
Tower Silo Under Construction
This exhibit has been prepared by the Department of Agriculture and Stock with the object of illustrating approved methods which can be used for the Conservation of fodders

Plate 73.

FODDER CONSERVATION.—Modern practice in stock food storage was impressively demonstrated by this display in the Court of Agriculture arranged by field officers of the Agricultural Branch. Model silos—stack, pit, and overhead—built to scale, and a variety of stock foods illustrated means, methods, and the finished products.

SORGHUM
· SACCHARINE ·
This Exhibit Has Been Prepared To Illustrate The Work Which Has Been Carried Out For A Number Of Years By The Department Of Agriculture And Stock With Grain & Saccharine Sorghums
Good Quality Grain Sorghums
With Maize or Wheat

Plate 74.

Grain Sorghums.—This exhibit illustrated the work of the Department of Agriculture and Stock in the development of suitable types for Queensland conditions. Good-quality grain sorghums compare, pound for pound, with maize or wheat in poultry-feeding.

Caustic Vine
A poisonous plant
Prickly Lettuce
Zamia
Marshmallow
Poisonous Weeds.
The Botanical Branch will report on any specimen sent.
Milky Cotton Bush
Purple Thorn Apple
A very poisonous weed
Dead Nettle
Crows foot Grass
A poisoner to stock
Paddy's Creeper
A poisonous weed
Cestrum

Plate 75.

PASTURE GRASSES AND POISONOUS PLANTS IN EDUCATIONAL CONTRAST.

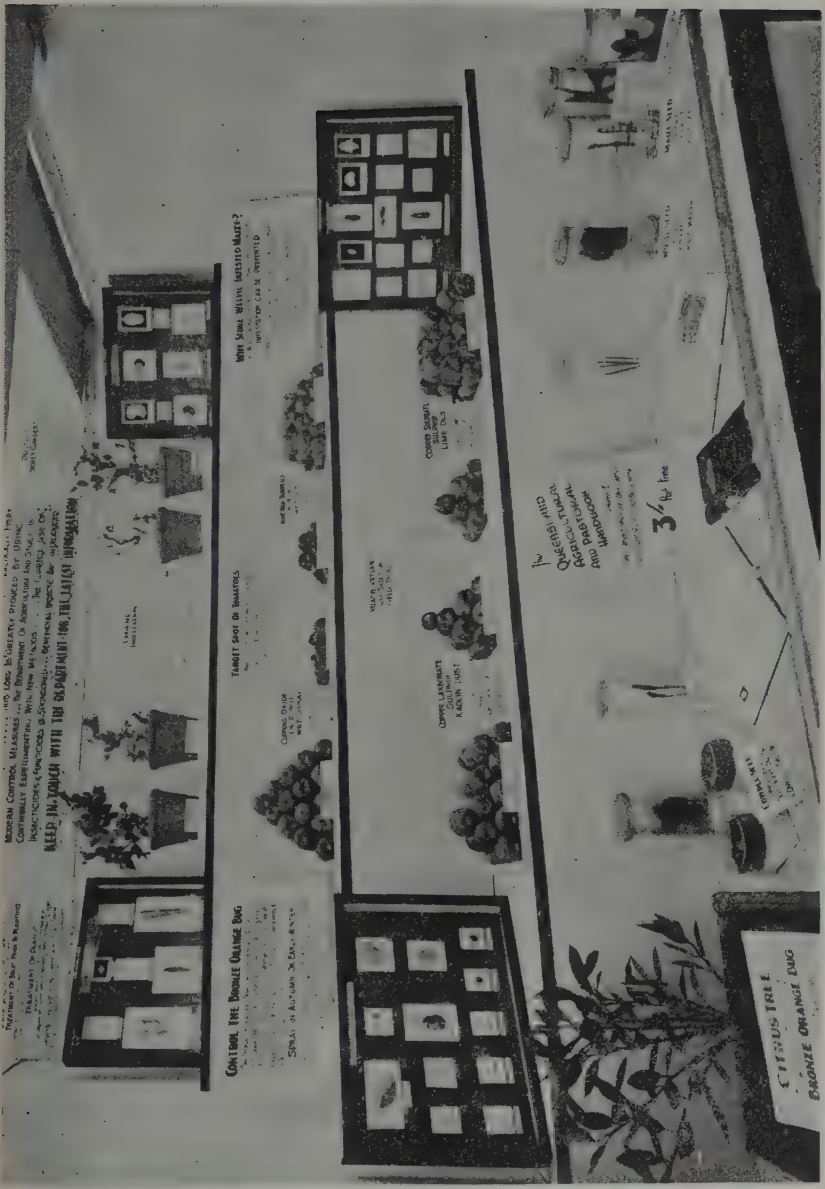
MODERN CONTROL MEASURES
KEEP IN TOUCH WITH THE DEPARTMENT FOR THE LATEST INFORMATION
CONTROL THE BRONZE ORANGE BUG
SPRAY IN AUTUMN OR EARLY WINTER
TARGET SPOT OF TOMATOES
WHY STORE WEEVIL INFESTED MAIZE?
INFESTATION CAN BE PREVENTED
COPPER SULPHATE SULPHUR LIME DUST
COPPER CARBONATE SULPHUR KAOLIN DUST
THE QUEENSLAND AGRICULTURAL AND PASTORAL HANDBOOK
3/- Post free
CITRUS TREE
BRONZE ORANGE BUG

Plate 76.

THE ETERNAL WAR AGAINST VEGETABLE PESTS AND DISEASES.—In this alcove in the Agricultural Court the work of the Research Division was impressively illustrated.

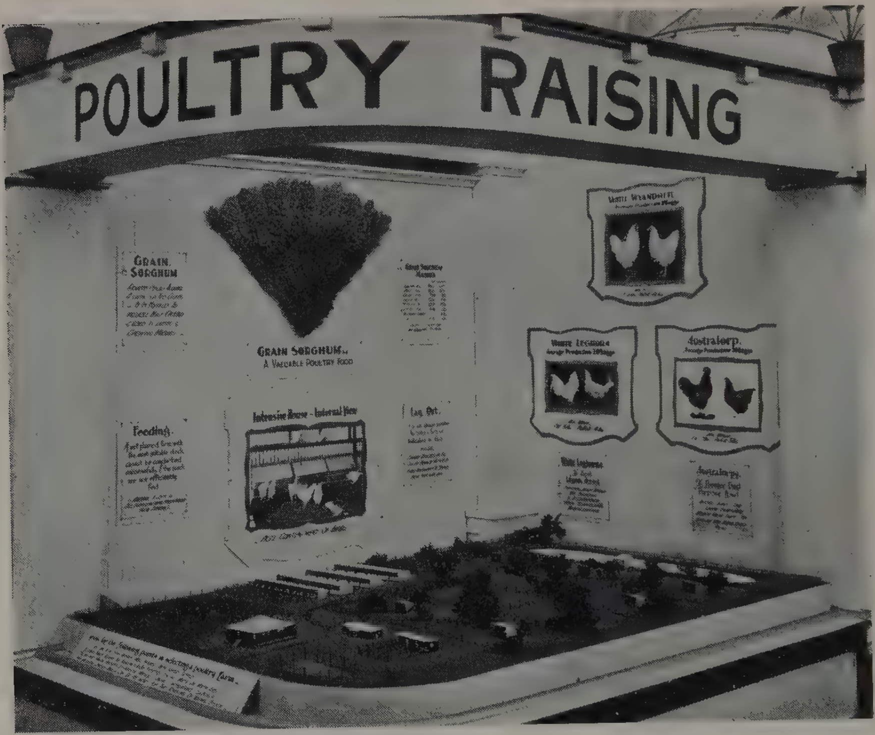
POULTRY RAISING
Grain Sorghum
Grain Sorghum..
A Valuable Poultry Food
Feeding
Intensive House - Internal View
White Wyandotte
White Leghorn
Australorp

Plate 77.

The Poultry Alcove in the Agricultural Court.—Production in the Queensland poultry industry continues to expand at a remarkable rate. Nearly 30 per cent. of the Queensland Egg Board receivals are exported to Britain, where the quality of the shipments has stimulated an increasing demand.

AGRICULTURAL JOURNAL
QUEENSLAND DEPARTMENT OF AGRICULTURE AND STOCK
INFORMA SERV FOR FARMERS
Queenslan
FREE TO THE
RIOTIC FUND
LET YOUR MONEY
JOIN THE COLOURS
YOU CANT
LET YOUR PENNIES
THE ARMY.

Plate 78.

The Journal Corner.—A well-organised and efficient information service for farmers at the Show was provided by the Department of Agriculture and Stock. Messrs. Frank Richards and Stan. Ives were the young officers in charge.

PIG RAISING
GRAZING FOR PIGS
Means Less Labour, Lower Costs
SUITABLE PASTURE
Prevents Worms & Rickets
GRAZING MEANS
Healthier Pigs More Profit Leaner Bacon

Plate 79.
Points in Piggery Management.

SHADE FOR PIGS.

Adequate shade for pigs should be provided during summer. The ordinary sty, particularly if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If there are no trees nearby, a wooden shed will do.

Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling itself. Unfortunately, the wallow sometimes seen on the pig farm is a filthy puddle-hole. If there is infection of any kind in the yard, it is to be found in just such a place. Dirty wallows should be drained and filled in, and a concrete or similar bath provided. This can be kept clean, and the risk of infection diminished.

Comfortable and hygienic conditions are most important in maintaining the health and well-being of pigs.

SKIM MILK FOR PIGS.

Skim milk and butter milk—they should not be mixed with wash water—are of equal feeding value. These dairy products supply all the proteins necessary to balance the carbohydrate content of the grain portion of the pig's ration. Together with lucerne, rape, barley, or other green feed—which may be either grazed or fed in the pig pen—they form an excellent ration.

Agricultural Notes

Paris Green Bait Substitutes.

PARIS green is almost unprocurable at present and the place of this insecticide in pest control practice must therefore be filled by other arsenicals which can be obtained without difficulty. Paris green has been very generally used as the toxic ingredient in poisoned bran baits for the control of cutworms, armyworms and false wireworms. It was preferred in those baits because of its intense green colour; the small amounts used imparted to the bait a faint green tint which served as an indicator of thorough mixing. Now that this material is not available, other arsenicals must be used, and some modifications in the formula of the bait and in the method of mixing it will be necessary.

Two suitable substitutes for Paris green are arsenic pentoxide and arsenate of lead. When using the alternative arsenicals, some consideration must be given to their relative toxicities and it is adequate to consider toxicity in terms of arsenical content. The following table indicates the arsenical content of the three compounds under discussion:—

Type of Arsenical Compound.	Arsenical Content Expressed as Arsenic Trioxide (As_2O_3).
Arsenate of lead	25·8%
Paris green	55 %
Arsenic pentoxide	71·4%

It will be noted that the arsenical contents of arsenate of lead, Paris green, and arsenic pentoxide, respectively, are approximately in the ratio of 1 : 2 : 3. Cutworm bran bait formulæ have in the past been most conveniently expressed in quantities involving the use of 1 lb. Paris green, which is roughly equivalent to either ¾ lb. arsenic pentoxide or 2 lb. arsenate of lead. The calculated arsenic trioxide content of these quantities of the arsenicals are as follows:—

Arsenical Compound.	Arsenic Trioxide Content.
1 lb. Paris green	0·55 lb.
¾ lb. Arsenic pentoxide	0·54 lb.
2 lb. Arsenate of lead	0·52 lb.

A bait with arsenate of lead as the toxic ingredient may thus be made up as follows:—Thoroughly mix together 2 lb. arsenate of lead and 25 lb. dry bran. The mixing must be thorough, and, to aid this, the bran should be spread out on the mixing board and the arsenate of lead powder sprinkled over it. These materials should then be turned and mixed several times to ensure that the poison is uniformly distributed through the bran, remembering that as arsenate of lead is a white powder, visual proof of thorough mixing will be lacking. Dissolve 4 lb. molasses in 1 pint boiling water and make the solution up to 2 gallon. Pour the solution on to the poisoned bran and mix the ingredients to the consistency of a uniformly moist but loose mash.

Alternatively, arsenic pentoxide may be used as follows:—Dissolve ¾ lb. arsenic pentoxide in 1 pint of boiling water and similarly mix 4 lb molasses in 1 pint of boiling water in another container. Mix the two solutions and add cold water to make the whole up to 2 gallons. Place 25 lb. dry bran on a suitable mixing board or in a large tub and pour the poisoned solution on to it. Mix all of the ingredients thoroughly to the consistency of a uniformly moist loose mash.

The quantities of poison used in each of these formulæ should not be exceeded, for there is evidence to show that for some pest smaller amounts may be effective. Thus in the control of plague locusts a bait containing ½ lb. arsenic pentoxide in each 25 lb. bran is known to be effective.

The bait containing arsenic pentoxide will burn tender foliage, owing to its high soluble arsenic content. It should therefore be used chiefly for eradicating cutworms or false wireworms in the field before a crop is planted. The bait may also be used on grassland for the control of insects such as armyworms, provided the mash is broadcast evenly and thinly over the pasture. In preparing and distributing this bait it is advisable first to smear the hands with petroleum jelly or axle grease.

The bait containing arsenate of lead, has a very low soluble arsenic content and may be safely used for the control of cutworms or false wireworms attacking seedbeds or for protecting seedlings recently planted out in the field.

The above formulæ will usually give sufficient bait for the treatment of about ½ to ⅔ acre of ground. Where seedlings are already established, the bait should be scattered thinly between the rows; otherwise it should be broadcast thinly. Distribution should occur in the late afternoon so that the bait will be moist and attractive for the night feeding insects. All mixing implements and vessels should be thoroughly cleaned and the hands scrubbed after preparing and distributing any bait.

SEEDS OF NATIVE GRASSES.

Within recent years intenser interest has been shown, both by pastoralists and by dairymen, in the sowing-down of pastures of drought-resistant native grasses. Many graziers who have sought information about the availability of native grass seeds desire seed for the artificial reseeding of natural pastures which have been thinned out by drought. Numerous other sheep and cattle raisers are eager to sow-down, on their own properties, drought-resistant native grasses from other parts of the State. Many dairy farmers also desire to test out the best of the native pasture grasses under local conditions.

Grasses most in demand by pastoralists are the Mitchell grasses. There are four distinct types of Mitchell grasses—Curly Mitchell, Hoop Mitchell, Barley Mitchell, and Blue Mitchell—and of these, perhaps, the best one for general purposes is the Curly Mitchell.

Seed of Curly Mitchell is now being collected in large quantities for commercial purposes. If sown broadcast about 4 lb. an acre should suffice to give a good stand; and this quantity may be reduced by half if the seed is sown in drills with a combine.

In some circumstances, one or more of the other three types of Mitchell grasses are to be preferred to the Curly Mitchell, but, so far as can be ascertained, no seeds of these types are yet available.

While the purchaser of Mitchell grass seed has at present little choice in the matter of the origin of the seed (practically all of the seed being harvested in northern New South Wales), he should bear in mind that seed collected in his own district or in a district with similar climatic conditions is likely to be better for local sowing than seed from other sources.

Seed of Australian blue grass has been on the market for many years. This, also, is harvested in New South Wales, and, consequently, may not be as valuable as locally collected seed for sowing in Queensland.

KIKUYU GRASS—A GOOD PASTURE BUT A BAD WEED.

Introduced from East Africa some years ago, Kikuyu grass has gained favour with dairy farmers, although many old-established stands now seem to be declining in productivity.

Kikuyu grass is a perennial which spreads rapidly over and through the ground by means of running stems. Both the surface and underground runners root freely at the nodes, anchoring the plant firmly in the ground and forming a dense turf which stands heavy trampling by stock. The stems carry a large quantity of leaf, and the stems also are very succulent. Under good conditions, Kikuyu grass makes a very dense growth, often 2 feet or more in height.

In Queensland the grass has adapted itself fairly well to different districts. It does best under warm, moist conditions, but will withstand a considerable degree of cold and keep green in spite of fairly severe frosts. For this reason it is very valuable for late autumn and early winter feed. Its drought resistance is fairly good, and some success with the grass is reported from the Burnett and Darling Downs.

Kikuyu grass spreads most quickly and yields most heavily on loose, rich soils; and while it may provide fair grazing on some less fertile soils of a sandy or clayey nature, it is advisable to restrict plantings to rather productive soils, unless in special circumstances—such as when a grass is required for rough places or as a soil binder to prevent erosion. Kikuyu grass makes a heavy drain on the soil, and periodical ploughing or severe cultivation is necessary to improve the soil conditions.

In Australia, Kikuyu grass sets seed very rarely, and commercial supplies are not available. It is necessary to establish the grass by planting pieces of the runners.

In addition to its value as a pasture grass, Kikuyu grass has some value for bracken control. If planted out in bracken Kikuyu attracts stock, which trample down the fern while feeding on the grass.

Although a very valuable grass in its place, Kikuyu grass may become a troublesome weed if it is permitted to encroach on ploughed land. For this reason it should not be planted near areas likely to be required for cultivation. In wet weather portions of the grass are often broken off by grazing animals, and these pieces may be carried on the hooves to other portions of the farm and become established after tramping in. Patches started in this way on land required for cultivation should be dug out immediately.

WHY BIRDS SHOULD BE PROTECTED.

At this time of the year, when birds are nesting, an earnest appeal is made to all to become interesed actively in the preservation of wild bird life. The value of birds in our rural economy is incalculable. It has been well said that the service that birds render in protecting forest trees is more nearly indispensable to man than any other benefit they confer on him. Were the natural enemies of forest insects annihilated, every tree would be threatened with destruction, and man would be powerless to prevent the calamity. He might make shift to save some orchard or shade trees; he might find means to raise some garden crops; but the protection of all the trees would be beyond his powers. Yet this herculean task ordinarily is accomplished as a matter of course by birds and other insectivorous creatures without trouble or expense to man.

During recent grasshopper visitations, many thousands of starlings were to be seen feeding on the insects, but starlings were not alone in their assault on the common enemy. Every insectivorous bird fed to fullness on the hoppers. The indiscriminate shooting of bush birds has, therefore, nothing to commend it from any point of view.

Fortunately, very few native birds are not protected legally, but even the despised crow is a friendly ally in the continuous war against insect pests. Crows eat grasshoppers, and it takes a lot of hoppers to fill the craw of a crow. The crow also is an energetic scavenger. It eats carrion and maggots. From maggots come blowflies, and the loss to Australian woolgrowers caused by blowfly infestation runs into millions of pounds annually.

LUCERNE HAY.

Baled lucerne hay, or lucerne chaff, and maize grain are now recognised as the basis of all supplementary or drought feeding, if the fodder has to be transported over long distances. Increased attention is, therefore, being given to the production of good-quality lucerne hay. Good hay containing 45 per cent. to 50 per cent. of leaf will always command a good price, while a weathered or sweated consignment will be hard to sell.

Very careful handling is required from the time lucerne is cut until it is stacked or baled for market. Prime lucerne hay should be green in colour, dry, free from weeds or rubbish, and should contain a high proportion of leaf. Prevailing climatic conditions are naturally an important factor, and, whenever possible, cutting should commence in bright, fine weather. Lucerne should be cut shortly after the first flowers have appeared, when numerous young shoots will usually be observed at the base of the crowns. When the plants are allowed to become over mature, actual loss of weight and feeding value occur, as leaf will be lost, and the stems will harden, thereby becoming largely indigestible. It is customary to commence mowing in the morning as early as possible, after any heavy dew has evaporated. During fine, hot weather, raking may commence about midday. Raking into windrows should, if practicable, be completed by nightfall, as much leaf may be lost if the lucerne is left too long in the swath. After wilting for a few hours in the windrows, fork into high narrow cocks which encourage the natural transpiration of moisture better than if broad flat cocks are made. If rain occurs the lucerne will require turning to prevent the formation of mould, but during fine, hot weather it is possible to stack within two days of cutting. Excess moisture will induce mould, and possibly combustion in the stack, while if the lucerne is allowed to become too dry, it will lose appreciably in palatability, weight, and appearance. Before carting, the stems should be tested by twisting them between the hands, when any excess moisture will become evident.

Wherever possible, lucerne hay should be stored in sheds, but if it becomes necessary to stack it in the field, a framework of logs should be laid down, care being taken to keep the centre of the stack high during building. Large stacks which are likely to be held for some years may be protected by thatching or by a temporary galvanised iron roof.

Proximity and accessibility to the chief markets is obviously an important factor in the profitable production of lucerne hay for direct sale.

* * *

GOOD SEEDS.

Although nearly everyone will agree that better seeds mean better crops, it must not be overlooked that better cultivation means better seeds.

Seeds to be good must have a high germinating capacity, be true to variety name, and free from weed seeds, inert matter, and disease or insect infestation. No matter how careful the grower may be, all crops will contain some plants other than those which it is intended to produce. A cleaning machine should, therefore, be used before the seed is offered for sale. In Queensland, as in every other part of the world, the most critical buyers will be found among the merchants with efficient cleaning machinery.

A modern seed-cleaning plant can make good samples of uncleaned seeds better, but it cannot make bad samples good. With a full knowledge of their machinery possibilities, most merchants are willing to buy on a clean seed basis. They are not, however, inclined to purchase poor samples, and the usual market for seeds of indifferent quality is with dealers who have little appreciation of impurities. The actual seed user who insists on buying his supply on a price rather than on a quality basis encourages the vendors of goods of inferior quality. Unfortunately, seeds of indifferent quality usually carry a large profit to the seller.

Good seeds cost money to produce and money to clean, and the general improvement of farm seeds rests largely with the farmers themselves. When practically every farmer insists on a high-grade product the demand for poor-quality seeds will cease. Only the best-quality seeds are worth buying.

Horticultural Notes

Mite Injury of Tomatoes.

WITH the approach of the warmer spring months, tomato growers in central Queensland will need to take precautions against injury caused by the tomato mite.

The mite is minute, creamy-white to greyish in colour, and invisible to the naked eye. Its presence, therefore, is not detected until the first symptoms of injury appear. Normally the field crop does not show obvious symptoms until in bearing, but seedbeds and newly planted-out seedlings may carry heavy populations of the pest. The mites breed rapidly, particularly if a wet period is followed by warm weather.

Mite injury to tomato plants is frequently wrongly attributed to unfavourable soil or climatic conditions. The injury, however, is quite characteristic and is first seen at the base of the plant. The lower leaves curl slightly, acquire a bronze colour, wither, and die. The stem loses the surface hairs, becomes smooth and smoky in appearance, and may show superficial cracks. Because of the stem discolouration, mite injury is often known as ''smoky stem.'' The mites gradually spread along the vines towards fresh growth, discolouring the stem and destroying the foliage until, ultimately, only small bunches of new growth remain at the tips. Heavy blossom loss is common, and the setting of the fruit is seriously curtailed. In Central Queensland, stem and foliage injuries are most important, but occasionally, in very heavy infestations, fruit may be damaged. Attacked fruit loses its lustre and then develops a pronounced darkening and cracking of the skin, which produce an unsightly though usually edible fruit.

Smaller fruits, a shortened picking period, and greater susceptibility of the fruit and stem to sunburning are some of the obvious results of mite attacks.

The wild gooseberry, the cape gooseberry, and other allied plants commonly found in the tomato areas of Central Queensland carry a mite similar in habits and appearance to that on the tomato plant. Mites on these weeds very probably spread to the tomato plant, and clean cultivation throughout the season on the headlands and within the field is therefore desirable.

Sulphur dusts and sulphur compounds are very satisfactory for the control of the tomato mite.

Proprietary dusting sulphurs, flowers of sulphur, or ground sulphur can be used at the rate of 4 lb. to 14 lb. per acre, depending on the age and size of the treated plants. The addition of an equal quantity of fine hydrated lime or kaolin to the flowers of sulphur or ground sulphur gives a free running dust which is more easily applied than sulphur alone.

Lime sulphur, one in 80 to 120, gives excellent control, the weaker dilution being used in warm weather. Several proprietary brands of wettable sulphur are also satisfactory.

A thorough spraying with lime sulphur checks mite infestation more quickly than the sulphur dusting, but the effect of the latter treatment persists for a longer period.

Tomatoes should be treated from the seedling stage onwards, the interval between applications depending on the weather. In the warmer months treatments may be necessary every fortnight, but in the winter once in six months may be sufficient.

In the warm coastal areas, the successful culture of tomatoes without the use of mite control measures is frequently impossible. The loss of foliage cover is such that plants wilted by the tomato mite seldom regain their normal vigour. Consistent attention to the control of the tomato mite will result in better yields, larger and more attractive fruit, and a marked extension in the bearing period of the crop.

THE VALUE OF HUMUS IN THE CITRUS ORCHARD.

Humus is an organic compound formed by the decay of vegetable matter in the soil, and is of great value in the citrus orchard.

Comparatively small amounts of humus are present in hot, dry localities on account of the higher temperatures. In such areas the humus is burnt out of the soil rapidly and does not accumulate to the same extent as it does in a moist or cool climate. Humus possesses the power of retaining moisture in the soil, whilst other advantages are that it makes heavy soils more porous, and sandy soils more cohesive.

It is possible to maintain a high humus content in the soil by annually working in vegetable matter—such as stable manure, green cover crops, leaves, and weeds—for these, if used, supply decaying vegetable matter to the soil.

When the humus content is low, sandy soils lose water quickly, and heavy soils become hard and baked after heavy rains. Under such conditions, trees make poor growth, and the tops of the trees become thin. Small fruit may be formed, and it is subject to sunburn and splitting.

It is, unfortunately, difficult to obtain anything like adequate supplies of stable manure or similar material of a humus-forming nature, and, in order to make up the deficiency, the growing of green manure crops between the trees at times to correspond with the rainy season is recommended. Growing cover crops during dry periods is not desirable, because trees must not be deprived of the available soil moisture at such times. Under average conditions, green crops should be planted in citrus orchards about February and may be turned under about June.

MARKING TREES IN THE ORCHARD.

Because it is found impracticable to apply corrective methods immediately to drone fruit trees, or to trees known to require some specialised treatment for disease at some more opportune time, it is wise not to leave future identification of the tree to guess work. The simplest way of marking such trees is by tying a narrow strip of cloth—preferably white— to a conspicuous limb.

In the case of individual trees giving light annual crops, pruning may be at fault. It is possible, too, that an individual tree may be a host of some serious pest that has not yet established itself throughout the orchard. The white rag indicator will serve as a reminder at a time later on when the necessary control can be conveniently applied. By marking the tree, the observant orchardist also will be able to note from time to time the efficiency of the control applied.

Unsuitable varieties and poor fruit types observed during harvesting and marked are not likely to be overlooked when reworking is being done in the proper season if they can be easily identified.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

AUGUST was a month of disappointments from the marketing standpoint. Prices which normally show at this time of the year a tendency to rise were on a downward curve.

Complaints about immature fruit have been received from all markets, in respect particularly of papaws, pineapples, and tomatoes. The remedy is obviously in the grower's own hands. Many lines have already been rejected because of non-conformity with accepted standards. New marketing regulations governing matured and size standards gazetted recently in Queensland and New South Wales should remove all causes of complaint in the future.

Prices during the last week of the month were:—

TROPICAL FRUITS.

Bananas.

Sydney.—Cavendish: Sixes, 14s. to 17s.; Sevens, 16s. to 19s.; Eights and Nines, 18s. to 23s.

Melbourne.—Cavendish: Sixes, 13s. to 17s.; Sevens, 14s. to 19s.; Eights and Nines, 18s. to 21s.

Newcastle.—Cavendish: Sixes, 16s. to 18s.; Sevens, 18s. to 19s.; Eights and Nines, 20s. to 21s.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 7s. case; 1s. 6d. to 5s. dozen. Roughleaf, 4s. to 6s. case; 1s. to 4s. dozen.

Sydney.—Smoothleaf, 6s. to 8s.

Melbourne.—8s. to 10s. case. Blackheart prevalent.

Newcastle.—6s. to 9s. case.

Adelaide.—11s. to 13s.

Passion Fruit.

Brisbane.—Firsts, 7s. to 10s.; Seconds, 4s. to 6s.

Melbourne.—12s. to 15s. half-bushel.

Papaws.

Brisbane.—Locals, 2s. to 3s.; Specials, 3s. 6d. to 4s. 6d. bushel; Gunalda, 3s. to 4s. bush; Yarwun, 5s. to 7s. tropical case. Green fruit hard to sell.

Sydney.—8s. to 11s. Green fruit hard to dispose of.

Melbourne.—8s. to 14s. Coloured lines wanted.

CITRUS FRUIT.

Oranges.

Brisbane.—5s. to 7s., inferior lower; Navels, 6s. to 8s.

Mandarins.

Brisbane.—Emperors, 6s. to 10s.; Scarlets, 3s. to 8s.; Glens, 7s. to 11s.; Ellendales, 9s. to 13.

Poor grades of all varieties 2s. to 3s. lower.

Lemons.

Brisbane.—7s. to 11s.; Inferior, 4s. to 6s.

Grapefruit.

Brisbane.—5s. to 8s.

Strawberries.

Brisbane.—6s. to 11s. dozen boxes; inferior lower.

Newcastle.—9s. to 12s. dozen boxes.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Tasma, 6s. 6d. to 8s. bushel; Granny Smith, 8s. to 11s.; Sturmer, 6s. 6d. to 8s.; Crabs, 6s. 6d. to 7s. 6d.

Tomatoes.

Brisbane.—Green, 2s. to 3s.; Coloured, 3s. to 4s.; Specials to 4s. 6d.

Sydney.—4s. to 6s.; Special and repacked lines higher.

Melbourne.—5s. to 7s. half-bushel; few higher.

MISCELLANEOUS, VEGETABLES, ETC.

Cabbages.—9d. to 3s. dozen.

Lettuce.—1s. 6d. to 3s. dozen.

Rhubarb.—8d. to 1s. bundle.

Cauliflowers.—4s. to 10s. dozen.

Beans.—Brisbane, 8s. to 11s. bag; poor quality lower. Melbourne, 2d. to 4d. lb.

Peas.—Brisbane, 5s. to 8s. bag; Melbourne, 2d. to 3d. lb.

Pumpkins.—5s. to 6s. 6d. bag.

Marrows.—2s. 6d. to 5s. dozen.

Parsnips.—9d. to 1s. 6d. bundle.

Carrots.—3d. to 9d. bundle.

Beetroot.—3d. to 8d. bundle.

Cucumbers.—Brisbane, 10s. to 12s. bushel; Melbourne, 12s. to 16s. bushel.

LADY FINGER BANANAS.

The fruit of the Lady Finger variety of banana has a very pleasant flavour, its keeping qualities are good, and it is always in demand.

Alluvial flats with a subsoil of free clay suit the variety best, but it can be grown successfully on hillsides of even contour where the rainfall is copious and regular, and where shelter is provided from heavy winds.

Thorough preparation of the soil is necessary, and, where possible, it should be worked to a depth of at least 12 inches. Healthy butts, at least nine months old, with a minimum diameter of 6 inches, are the best planting material. On the loamy flats the distance apart should be 18 feet by 16 feet, with three followers; on hillsides and other less favoured sites, 15 feet by 15 feet, with two followers.

To prepare for planting with two followers, the butt should have about 2 feet of the pseudo stem left and all visible eyes or buds gouged out with the exception of two, which should be on opposite sides. The same method is adopted for three followers, except that three buds are left spaced equally round the butt.

Two, or, as the case may be, three suckers will appear in a short time after planting and trees are allowed to grow, but all other growth must, for at least nine months, be removed as soon as convenient after it appears above the soil. After the selected suckers have made two-thirds of their growth towards maturity, giving them a height of approximately 8 feet, a follower can, under favourable conditions, be selected on each plant in a straight line away from the parent plant and left to form the fruiting material for the second crop. The growth habit by which successive suckers may be selected in a straight line away from the original plant will persist for the life of the plantation, and all other growths should be removed as soon as possible. By careful attention to this and other cultural methods, maximum returns can be expected and realised.

Periodical applications of fertilizer, when the soil is of average fertility, will have beneficial results.

Cultivation should be shallow to avoid destroying the root system.

The planting of Mauritius beans down the centre of each row at a distance of 30 inches between plants would ensure a good mulch during hot summer weather and considerably retard weed growth.

Covering of the fruit with a suitable material, as advocated for Cavendish and Mons Marie varieties, during their maturing periods amply repays the grower.

General Notes

Staff Changes and Appointments.

Mr. B. R. Martin, B.Sc., has been appointed Instructor in Pig Raising, Department of Agriculture and Stock.

A Regulation issued under *The Primary Producers' Organisation and Marketing Acts* provides that the canary seed hail insurance regulations shall not apply to and shall have no force or effect in respect of canary seed planted during the year 1940.

The officer in charge of Police at Dajarra has been appointed also an acting inspector of stock.

Mr. E. P. Flegler has been appointed millowners' representative on the Tully Local Sugar Cane Prices Board, *vice* Mr. S. Theodore, resigned; and Mr. J. W. Clayton has been appointed millowners' representative on the Isis Local Sugar Cane Prices Board to fill the vacancy caused by the death of Mr. A. Adie.

Messrs. F. H. Bishop, Chermside, and T. P. W. O'Keeffe, Hamilton, have been appointed honorary rangers under *The Native Plants Protection Act* and honorary protectors under *The Fauna Protection Act.*

Mr. J. V. Hayden, manager, Gin Gin Co-operative Sugar Milling Association, Ltd., has been appointed millowners' representative on the Gin Gin local sugar cane prices board in place of Mr. J. Cormack.

Mr. H. C. F. Mackie, Burra Burri, Proston, has been appointed an honorary inspector of stock.

Mr. J. H. Rayner, Scarness, has been appointed an honorary protector of fauna.

Cane Committee Levies.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Qunaba, Inkerman, and Fairymead mill suppliers' committees to make further general levies for administrative purposes at the rate of one penny per ton, in each case, on suppliers of sugar-cane to the Qunaba, Inkerman, and Fairymead mills, respectively.

Levies already in force for these mill suppliers' committees are:—Qunaba ¼d., Inkerman ¾d., and Fairymead ½d.

Pineapple Levy.

A Regulation has been issued under *The Fruit Marketing Organisation Acts* empowering the Committee of Direction of Fruit Marketing to make a levy on all pineapples marketed during the ensuing twelve months.

The sums raised by the levy will be expended for administrative, advertising, and stabilisation purposes in the general interests of pineapple growers.

The pineapple levy has been in force for a number of years, but the present Regulation provides for an increase from ½d. to 2d. per case for Smoothleaf pineapples, while the levy for the Rough and Ripley varieties remains at ½d. per case.

Peanut Board.

The election of growers' representatives on the Peanut Board resulted in the return of the present members, Messrs. Adermann and Young.

The voting was as follows—

DISTRICT NO 1 (WIENHOLT AND NANANGO).

	Votes.
Charles Frederick Adermann (Kingaroy)	223
Leslie Vivian Young (Wooroolin)	202
Daniel Noel Carroll (Kingaroy)	101
Hans Larsen (Boonenne, Kingaroy)	88

The successful members will be appointed for a term of three years. Messrs. Nothling and Quilter were returned unopposed for Districts 2 (Central Queensland) and 3 (Rest of Queensland), respectively.

Pig Imports.

An Order in Council has been issued under *The Diseases in Stock Acts* prohibiting the introduction into Queensland of swine infected with contagious porcine abortion, or suspected of being so infected, unless they have been submitted to the agglutination test for contagious porcine abortion, and found not to react by a Government veterinary surgeon, or an approved veterinary surgeon.

Gifts for the Troops. Canteen Orders.

Canteen orders on Australian Defence Canteens Service are available to relatives, friends, and the general public for the benefit of men of the Forces in Palestine and in Australia. They are issued by all Money Order Post Offices and are similar to postal notes, with all the protection of a crossed cheque. They will not be available for the troops in the United Kingdom until Australian canteens are established there.

Canteen orders are obtainable throughout Australia in denominations of 5s. (blue ground), 10s. (red ground), and 20s. (purple ground). They enable the recipient to choose his own gift—that is, he can select what he wants—therefore duplication is prevented, delay is avoided, and postage is saved.

A canteen order can be used for the payment of goods only, and it is necessary for the soldier, when presenting his canteen order for making his purchase, to produce his pay book for identification purposes, thus ensuring that the rightful owner receives the gift. The name and number of the soldier, together with the name and address of the donor, appear on the order.

Goods sold in overseas canteens by the Australian Defence Canteens Service are not subject to any duties, sales tax, excise, or other imposts; therefore, Diggers are able to obtain far better value than is possible when gifts are purchased in Australia and posted to members of the A.I.F., while all canteens are carrying a wide range of products suitable for members of the Forces.

All profits made from the sale of goods in canteens operated by Australian Defence Canteens Service are the property of and are returned to the troops in the form of contributions to regimental funds or by the provision of additional amenities.

This system is suitable also for members of group organisations to contribute to a common fund for the purchase of canteen orders. These orders can be forwarded to commanding officers of units for distribution of gifts among the soldiers or for the provision of additional amenities for general distribution and use.

Farleigh Mill.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Farleigh mill suppliers' committee to make an additional levy for administrative purposes on suppliers of sugar-cane to the Farleigh mill at the rate of ¼d. a ton. A levy of ¼d. was imposed in June last.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) has announced the following adjustments and additions to the Cotton Staff of his Department in pursuance of Government policy for the expansion of the cotton industry, and to place that industry on a more efficient basis:—

Mr. W. G. Ferguson, who has hitherto been field assistant in the Department, has been appointed Cotton Pest Control Officer, and Mr. F. Chippendale, B.Sc.Agr., has been appointed Instructor in Cotton Irrigation. It is intended that the headquarters of these officers should be at Biloela.

The grading staff of the Cotton Section will be increased by the appointment of an additional grader, which position will be advertised. In addition, Mr. T. R. Wilbraham has been appointed an assistant cotton grader.

Mr. A. Hutchings, who has had experience in the Cotton Section at Biloela, has been appointed field assistant. Mr. R. W. George was recently appointed to a similar position.

The appointment has also been made as cadets in the Cotton Section of Messrs. N. H. Adams and H. M. Goulter, who have received the Diploma of Agriculture at the Queensland Agricultural High School and College.

The Minister also referred to the recent secondment of Mr. G. D. Hubbie from the Soils Division of the Council for Scientific and Industrial Research for at least two years for soils investigation work in the cotton areas.

In addition to these adjustments and appointments the full-time services of members of the extension staff of the Agricultural Branch of the Department are being utilised in the cotton stimulation programme.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

O'Connell River Plants Poisonous to Stock. Results of Feeding Experiments.

S.C.S. (Mackay)—

Plant specimens collected in the O'Connell River district have been identified as under:—

1. *Passiflora foetida*, a wild passion vine, native of South America.
2. *Trema amboinensis*, Broad-leaved Peach.
3. *Commersonia echinata*, Brown Kurrajong.
4. *Paspalum paniculatum*, Russell River Grass.
5. *Polygonum convolvulus*, a Smart Weed.
6. *Solanum nigrum*, Black Nightshade.
7. *Hibiscus heterophyllus*, a native Hibiscus.
8. *Alphitonia moluccana*, White Leaf.
9. *Macaranga tanarius*, sometimes called Wild Castor Oil.
10. *Trema aspera* var. *viridis*, a variety of Peach-leaf Poison Bush.
11. *Asclepias curassavica*, Red Head or Red Cotton Bush.
12. *Mallotus ricinoides*.
13. *Trema aspera*, Peach-leaf Poison Bush.
14. *Pipturus argenteus*.
15. *Phyllanthus albiflorus*.
16. *Callicarpa pedunculata*.

Nos. 13, 11, 6, and probably 10 are poisonous to stock. No. 11 is not often eaten by stock. No. 6 contains a poisonous alkaloid, solanin, in the green fruit and leaves. The symptoms observed in animals affected by solanin poisoning are narcosis and paralysis, and sometimes salivation, vomiting, and diarrhœa.

Recent feeding experiments have shown No. 13, the Peach-leaf Poison Bush, to be poisonous. It is quite likely that the variety No. 10 also is poisonous, and, perhaps, also the closely allied No. 2. Feeding on these peach-leaf poison bushes may be the cause of the deaths of stock on the O'Connell River. The feeding experiments carried out by the Poison Plants Committee of the Department of Agriculture and Stock so far indicate that the Peach-leaf Poison Bush is much more poisonous in North Queensland than in South Queensland. This is shown by feeding experiments carried out at Oonoonbah and Yeerongpilly respectively. At Oonoonbah, one experiment showed that 5 lb. of the plant were sufficient to kill a steer. At Yeerongpilly, it took 18 lb. of the southern plant to cause the death of a steer.

The densest growth of Peach-leaf Poison Bush occurs mostly in regrowth in new clearings.

If any further investigations of the area are made, it would be as well to observe whether the peach-leaf poison bushes have been trimmed by stock.

Dead Nettle or Henbit.

C.G. (Murgon)—

The specimen is the Dead Nettle or Henbit (*Lamium amplexicaule*), a native of Europe, now a naturalised weed in many parts of Australia. It is fairly common on the Darling Downs. It is closely allied to Stagger Weed, and, like that plant, is capable of causing staggers or shivers in working stock. Ordinary paddock resting stock, such as dairy cattle, are unaffected by the plant, and, as a matter of fact, for them it is regarded as quite a good fodder. It is only with animals that are driven or excited in some way that the symptoms are manifested.

Rural Topics

Value of the Light Horse.

It is the long-considered judgment of General Sir Harry Chauvel, the great Light Horse leader of the last war, that Light Horse is the most valuable arm of the land defences of Australia. He considers them the most mobile of the fighting forces, and that they must still be employed in the sort of country that would not be suitable for mechanised units.

"I cannot think it likely that any army invading Australia could bring sufficient tanks and armoured cars here to compete with the mobility of our mounted divisions," he said. "There is no comparison between the invasion of Poland by German tanks and armoured cars against Polish cavalry and the usefulness of our cavalry in the defences of an island continent such as Australia."

The Export Markets—Post-War Planning.

At the recent Hobart conference of the Australian Council of Agriculture an outstanding matter of interest to the producers of the whole Commonwealth was a suggestion for post-war planning for the disposal of our exportable commodities. It was accepted that the minimum requirement for post-war planning is a guaranteed market for a volume of exports equal to that of Australia's exports during the war.

It is understood that consideration will be given to post-war planning in relation to the pastoral and agricultural industries by the Commonwealth Government. The belief is that guaranteed markets overshadow all other factors in the post-war plan, and if an amicable settlement can be reached, all other relevant matters will fall fittingly into gear.

Frozen Bacon for Britain.

There is a growing feeling that of all the primary industries of Australia there does not appear to be, in any direction, so many opportunities for expansion as in the pig industry—more especially as, under existing conditions, bacon must be exported in a frozen state, leaving the curing to be done in England.

In view of the effect of the war on British trade with European countries, which are normally heavy suppliers of dairy produce, an unequalled opportunity is afforded Australian producers to supply the United Kingdom with bacon and pork. This opportunity for trade expansion should mean much more than the actual supplying of current requirements as far as possible, for by the supplying, in present circumstances, of excellent quality bacon to the British market, a demand may be set up which will enable the Australian producers to retain a much bigger proportion of that market after the war is over.

Flashes from "The Lighter."

From Canada every quarter comes "The Lighter," published by the Tobacco Division, Experimental Farms Service, of the Dominion Department of Agriculture. Statistics and pithily written field data, salted with humour and sparkling epigram, are its contents, and the following paragraph expresses its philosophy:

"In the light, quick smoke of the cigarette, an acquaintance is made. In the seclusion of the den, before an open fire, friendships deepen in the hazy sweetness of a mellow pipe. Man's own true philosophy comes to light under this influence. And, when one has feasted to the capacity at one of those rare banquets when the roast has been turned just to a nicety, when the dessert has been served as only an artist can serve it, then one turns naturally to that masterpiece of the tobaccos—the cigar. For nothing can round out a perfect dinner like a good cigar. In its three most widely used forms, the cigarette, the pipe, and the cigar, tobacco has become a tradition in its promotion of friendship and good spirits."

With an apology to old Omar, let us versify that slab of honest philosophy and twang a lilting tune on the departmental harp—

Now when the golden glory fades to grey
  On this the borderland of night and day
Sit down with us and light the evening weed
  That puffs the world and all its cares away.

Lacquering of Fruit Cans—An Interesting Experiment.

An interesting experiment, which may have far-reaching effect on the citrus industry, was conducted at Gosford (New South Wales) recently when cans of orange and lemon juice were packed.

For some years those concerned have been collaborating with the Federal and State Governments, can makers, and lacquer makers in the development of a lacquer which will protect the metal of ordinary fruit tins from the corrosive effect of the juices. Very promising results have been obtained from a locally-made product, and the experiment was designed to test it on a commercial scale.

A large number of cans were packed with various juices and concentrates, which will be opened and examined some months hence.

Blood Meal as Sheep Feed.

It has long been established that blood meal, containing 80 per cent. protein of a high quality and digestibility, is the most concentrated source of protein available to stock.

If suitably sterilised and mixed with a substance to preserve it, blood meal can be fed to sheep to increase and maintain the lamb crop, to check mortality in times of drought, and to keep grown sheep in reasonable condition.

The Plough as a Weapon of War.

The plough has always been regarded as the traditional symbol of peace, but now, because of its vital importance as a factor in national defence, it has, in effect, changed from an instrument of peace into a weapon of war.

In any broad view of the Empire war effort, fortunately time appears to be on the side of the British farmer, especially in the Old Country, where an enormous acreage of grassland is now being converted to cultivation. In this great forward movement, the agricultural engineer is working in double harness, so to speak, with the farmer. The agricultural engineering effort is now in full swing, and it will be no fault of the implement maker should the farmer fail to ''produce the goods'' for want of adequate field equipment. However, there is no likelihood of failure on that score, but the farmer will have to thank the engineer for his ability to do the job which the nation has allotted to the primary producer.

It is acknowledged that without agricultural engineering the farmer would be, to a large degree, helpless in the present war-time pressure on the producing industries, for there is no generous supply or surplus of man-power to enable the farmer to get the work done in more leisurely ways with horses. Horses for cultivation work are, of course, being used to the fullest extent possible, but the bigger factor in the war-time ploughing-up scheme is tractor power, which, of necessity, will continue to be the basis of war-time agricultural progress in Great Britain.

The British farmer is tackling his task forthwith on the right lines and in the right proportions. He is not aiming immediately at the maximum—and thereby running the risk of strained and over-taxed effort—but is working up gradually to a climax in power farming that should be very gratifying in its results.

The Pneumatic Tyre Increases Efficiency of Farm Machinery.

In a series of tests at Leeton Research Station, in New South Wales, it was shown that many advantages are to be obtained from fitting pneumatic tyres to farm and orchard wagons, headers, and other cultivation implements. Reductions in draw-bar pull of something like 50 per cent. were recorded in these tests, in addition to increased speed of work, earlier working of wet land, less damage to soft land, and many other benefits of particular value to both farmer and orchardist.

These advantages, however, were limited to machines hauled by horses or tractors. While the pneumatic-tyred tractor proved efficient under good farming conditions, it was not as satisfactory as the steel-wheeled or the crawler tractor under wet, sticky-soil conditions.

The general results of the tests indicate that double the load could be hauled under all farm conditions—that is, hard, muddy, and boggy farm roads, soft and boggy ploughed land and soft grass land—by the farm horses when the lorry was fitted with pneumatic tyres.

It was particularly noticeable that the rubber tyres increased the efficiency of the farm horses, even more under hard road conditions than under boggy conditions.

The value of pneumatic tyres for farm machinery is certainly appreciated to a greater extent than formerly in Australia.

Electric Fence for Fat Lamb Raising.

Fat lamb raisers in New Zealand are finding the electric fence is especially suited for use in fencing off breaks and such crops as rape. If rape is to be fed economically, some method of holding lambs on to the feed until it is eaten out is necessary; and for this purpose the electric fence, which can be put up and removed so easily, is hard to beat.

Cheapness and saving of time are the big advantages of the electric fence, but it must be well built, for good results cannot be obtained from a makeshift job. From experience it has been found that, unlike pigs, more than a single wire is required to hold sheep. Where it is necessary to put in a gateway, the overhead method of taking the power over the opening is the best.

—*From "The New Zealand Farmer Weekly."*

A New Hope for British Agriculture.

The agricultural policy of the British Government, which has developed from war-time necessity, has created a new hope for agriculture.

The Government has declared that both farmers and workers are entitled to a reasonable measure of security—and against that, it is admitted by every section of the community, there is no argument.

The new policy suggests that the importance of agriculture in the conduct of the war is fully realised. After the outbreak of the war the policy developed by fits and starts, as some obstacle had to give way under pressure, and later by steady progress.

In general terms, it was laid down that the land must produce more and farmers were urged to get on with the job. They had the encouragement of a grant for ploughing up permanent pasture. Now the British Government has given an undertaking that it will see that conditions are established that will enable the farmers to deliver the goods. It is acknowledged that a higher level of prices will be necessary, but rightly this level will guard against extravagant or uncontrolled increases.

As the new agricultural policy is amplified, early notions about ploughing are expanding and general field practice is undergoing some form of improvement. A reasonable wage to workers is to be part of the scheme for fixing prices, and the policy is to be one the farmers can follow with confidence.

There is no case of the British farmers and their men holding the country to ransom; there is only recognition that farmers can't do the impossible.

As in Queensland, the British farmer needs no spur to his patriotism in time of national emergency, but he must be given a fair and square deal and the British Government is, in effect, guaranteeing that he will get it.

Great Cattle Weights.

Pasture improvement and quality stud stock are two vital necessities in successful cattle raising. That was evident in a yarding of cattle at Flemington, near Sydney, recently. One pen of nine station-bred de-horned Shorthorn steers topped the market. The oldest was no more than two years and nine months; they were estimated to weigh from 980 lb. to 1,000 lb. when dressed, and they sold to £17 3s.; the average was £16 3s. 9d.

The principal paddock on which they had been running had been continuously top-dressed with a hundredweight of superphosphate to the acre for the past fifteen years.

On this property, during the past five or six years all cattle have been de-horned before reaching the age of four months. Above that age, the local experience is that de-horning is too severe on the cattle.

As an insurance against drought, 4,000 tons of fodder is conserved on this property. Top-dressing the paddocks has greatly increased its carrying capacity, but care is taken that when a dry time comes there is enough fodder conserved to meet the emergency.

The area of the holding is 13,000 acres and it is carrying comfortably 650 head of cattle, 80 horses, and more than 20,000 merino sheep. Could there be a better argument for good pasture management and improvement?

Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown row crops to keep down weeds and maintain a surface mulch, for rain falling on a caked surface soil may not penetrate to any great depth. To check losses of soil during summer storms, all row crops should be sown at right angles to or athwart the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, may be continued and sweet potatoes planted out.

More attention may be given to the sweet sorghums, both in the coastal areas and on the Darling Downs. On the Downs, the crop is profitably fed to cattle, horses, and sheep.

On the western Downs and Maranoa, farmers are advised to sow sudan grass, which has proved itself in recent years as a summer crop, whether for grazing, hay, or silage.

Growers should be in a position to provide State requirements of lucerne, wheaten and oaten chaff, sudan chaff, millet, and panicum chaff, stover, and other fodders.

As a summer-growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum) cowpea should be considered. Suitable varieties are groit, poona, brabham, and black. October is a good month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub burns, or ploughed land of reasonably high fertility, at the rate 8-12 lb. seed to the acre, adding white clover seed at the rate of 2 lb. to the acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed. No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub ''burn.'' From 4 to 6 lb. of tested seed to the acre usually provides a good stand.

In the wheat areas, haymaking will be in progress where crops are not too far advanced for this purpose. Crops cut a few days after the flowering stage contain the maximum nutritive value, the nutriment being then spread evenly thoughout the plant. A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour.

As harvesting becomes general during November, all necessary machinery should be given a complete overhaul, in order to avoid stoppages at a critical period.

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TICK TREFOIL—A VALUABLE FODDER PLANT.

Tests of the capacity for natural regeneration of tick trefoil, a valuable fodder plant, when protected from stock are now in progress near Blackall.

A specimen of one variety was received for identification from a station near Longreach by Mr. Cyril White, Government Botanist, recently. On the station it had been observed that the stock ate it greedily, and the owner thought that it might have possibilities as a fodder. This particular variety was first described from Sturt's Creek, in Central Australia. It is found in several districts in Queensland, but never in any great quantity, for the reason, probably, that stock soon eat it out.

The plant is abundant on one of the areas near Blackall now closed to stock for the purpose of studying the natural regeneration of grasses and fodder plants. The tick trefoil group is a large one and is well represented in Queensland. It has contributed greatly to the fodder value of wider areas of pastoral country, and most varieties are worth fostering. The plants take their name from the fact that the seed pod is divided into several one-seeded parts. Each of these parts breaks off and, clothed with tiny hooked prickles, it fastens on to clothing or the coats of animals and is thus carried from place to place.

Orchard Notes

THE COASTAL DISTRICTS.

OCTOBER.

OCTOBER is usually a dry month over the greater part of Queensland, consequently the advice given in the notes for August and September on the necessity of thorough cultivation to retain moisture is again emphasised. Thorough cultivation of all orchards, vineyards, and plantations is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch.

All newly-planted trees should be watched carefully; if they show the slightest sign of scale or other pests they should receive attention at once.

Bananas.

In the warmer districts, banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done before the winter, young plantations planted in the previous season should be desuckered without delay. Plants desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation there will be several seasons during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care should be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting ''collars of slips.'' Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. to the acre. Keep down weeds with a dutch hoe, but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are cut or disturbed wtih horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus prevent much fungus trouble in the summer pack.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of ''The Coastal Districts'' applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment the orchard and vineyard get the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards should be kept loose. In the western districts, irrigation should be applied whenever necessary, but growers should not rely on irrigation alone, and should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch to prevent surface evaporation.

All newly-planted trees should be looked after carefully and only permitted to grow the branches required. All others should be removed as soon as they appear. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, they should be dealt with at once by the use of such remedies as black leaf forty, bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, for if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and afterwards at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer localities, a careful check should be kept on any appearance of the fruit fly, and, if found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving much of the earlier-ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with bordeaux mixture, likewise grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot—the first indication of downy mildew—appears on the top surface of the leaf. Spraying wtih bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop; but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers may be certain that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is necessary, for if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

THE CHOKO.

The choko is a popular vegetable, grown largely in Queensland for both market and home use. It has the advantage that, once planted, it comes into bearing each year from the original root. The plant will die down only during the coldest months, and in the spring will shoot again from the tuber which is formed under the ground.

The choko requires a rich loamy soil to which has been added a heavy dressing of well-rotted stable manure. Additions of dried blood and bone dust, or of manure during growth, are of great benefit, as, being a perennial and a heavy feeder, the choko's food requirements are considerable.

The method of planting the choko differs greatly from that used for other varieties of the same family. Whole choko fruits are used as planting material, the growth coming from the shoot from the kernel in the fruit. The fruit should be planted on the side with the broad end sloping downwards and the stem end slightly exposed.

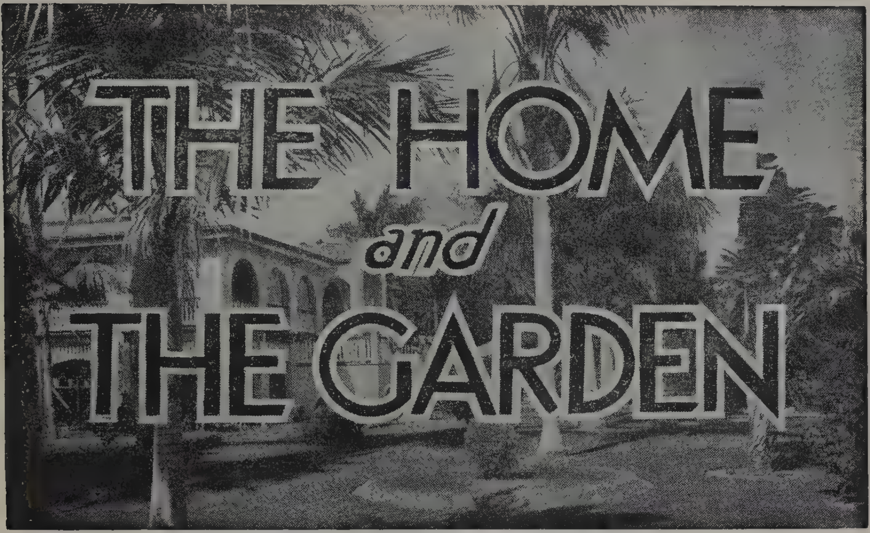
A trellis is essential to satisfactory growth, although, if planted near a fence or old stump, the plants will spread over it very quickly. When chokos are grown commercially, it pays to erect a suitable trellis. This may be done with logs or rough timber. Sometimes an ordinary "T" trellis is used, over which strong fencing wire is stretched.

A good permanent trellis may be constructed as follows:—Two rows of strong posts are set firmly in the ground with a height of about 6 feet 6 inches above the surface, the rows being about 9 feet apart and the posts about 8 feet apart in the rows. The tops of the posts support cross timbers on which strong fencing wire is stretched with about 18 inches between the wires to carry the vines. Stays support the outside posts, and wires for trellising also should be stretched on these.

The choko takes some months to come into full bearing, but will commence to bear fruit generally about four to five months after planting. The plants seem to improve with age when properly cultivated and manured.

There are two varieties, the green and the cream. The cream-coloured variety is the more popular.

Chokos should be picked fresh and, after having been peeled, should be cut into suitable portions and boiled or baked.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

YOUR CHILD'S TEETH.

IS anything more pleasing than to see your child's happy smile enhanced by two rows of pearly white teeth? Are any gems more handsome or more precious to their owner? With what interest does each mother watch the cutting of her baby's first teeth, little realising the very important part she herself plays in the formation of those teeth? What a big responsibility it is for a mother to realise that it depends largely on herself whether her little boy or girl is to have beautiful teeth that will last a lifetime or ugly overcrowded teeth that will quickly decay! Let us see what we can do to help her carry this responsibility.

How Teeth Develop.

Before baby is born the first teeth or "milk teeth" begin to form in the gums. As baby is entirely dependent on his mother for his nourishment it is important that she should eat the kind of food which goes to form sound teeth and that she should keep herself fit and strong by taking regular exercise and recreation in the fresh air and sunshine and by taking enough rest and sleep.

Mother's Diet.

From the earliest stage of his development baby needs lime and phosphorus to form good teeth as well as to form good bones, and so it is important that the food the mother eats should contain plenty of lime and phosphorus. For this reason the following diet is recommended for her:—

Three meals a day are sufficient and should include—

Milk—1½ to 2 pints as a minimum. (If fresh milk cannot be obtained, full cream dried milk may be used.) It may be flavoured with cocoa or taken with wholemeal porridge or in the form of junket or in milk puddings.

One egg.

Cheese—1 oz.

Butter—1½ to 2 oz.

Meat, in moderation. This may include the ordinary cuts as well as liver, rabbit, tripe, poultry, or fish. Liver and fish are valuable.

Vegetables—A liberal allowance of uncooked and cooked vegetables. Salads can be made from lettuce, tomatoes, celery, grated carrot, finely shredded cabbage heart, and sweet peppers. Most of these can be grown in a small vegetable garden. Cooked vegetables should include peas, beans, cabbage, cauliflower, and potatoes (English or sweet). Potatoes should be cooked in their jackets and eaten every day.

Fruit—Oranges, papaws, and pineapples are valuable, but all fruit in season is good when eaten in moderation. Uncooked fruit is better than cooked.

Bread and scones should be made of wheatgerm or wholemeal flour. Avoid bread and scones made of white flour or flour artificially coloured.

Cutting of Teeth.

About the seventh month—the exact age varies even in healthy babies—the first tooth appears, usually a lower middle or front tooth. Within the next two or three months all the front teeth may be cut. About the beginning of the second year the first back teeth usually appear, and at about eighteen months the eye teeth make their appearance between the front and back teeth.

Towards the end of the second year the last of the back teeth appear. This completes the first set of temporary or milk teeth, twenty in all.

Teething is a Natural Process.

While teething is a natural process it may cause some fretfulness and sleeplessness, and the child may refuse his food. This is due to pain or discomfort caused by swelling of the gums. Sometimes a baby will develop a cough when teething, due to excess secretion trickling to the back of his throat. No severe illness should be attributed to teething.

Preservation of Good Teeth.

Prevention is better than cure. In order to understand prevention, it is necessary to study nature's method of protection. Each healthy tooth has a white glistening protective covering called enamel, which is the hardest substance in the body. As long as the enamel is intact no harm can come to the tooth. Nature preserves the enamel by keeping it bathed in saliva. The quantity of saliva poured out in twenty-four hours may amount to several pints. Saliva does not flow continuously at the same rate. As soon as the sense of taste is stimulated, especially by weak acids such as are present in certain kinds of fruit, such as oranges, lemons, and apples, there occurs a flow of a thin watery saliva which persists for at least fifteen minutes. Nature's protective mechanism for the teeth is perfect for all animals who live in a natural state. Decayed teeth are rarely seen among them. Until about 100 years ago, when man began to eat refined cereal foods, his teeth also were well formed and well preserved. Sweet foods, especially when made from refined finely-ground flour, stimulate the secretion of a viscid sticky saliva, which with starchy material may form a paste which tends to become lodged in the crevices of the teeth, and in the spaces between them. Unless this is removed, fermentation may occur with the formation of acids which may attack any crack in the enamel. Once a break in the enamel occurs, the process of decay may continue until the vital part of the tooth is destroyed.

As it is important for the mother during pregnancy to take food of the right kind in order that sound teeth may be formed, so it is for the child after birth, if the teeth are to be preserved. The growth and development of the jaws, like that of other bones, depends chiefly on muscular action. In young children vigorous sucking is the best form of exercise, and every effort should be made to establish breast feeding. In older children the most important actions promoting the development of the jaws and of strong teeth are those connected with biting and chewing of raw food. Rusks, not tough crusts, should be given, and when he is old enough the child should be given a diet containing the foundation foods consisting of milk, eggs, cheese, butter, meat, green and root vegetables, wheatgerm bread, and uncooked fruit.

Care of the Teeth.

The teeth should be brushed after each meal with a medium or soft, short toothbrush having bristles of unequal length to enable them to get between the teeth. They should be brushed both back and front in an up and down direction. Many think

This, in turn, will lead to overcrowding of the permanent teeth. that the early decay of a temporary tooth is not important, but it may be a serious matter. Not only may it cause pain, but it may lead to loss of teeth, which will interfere not only with the child's nutrition, but with the development of his jaws.

The child's teeth should be examined by a dentist every three to six months from the time he is two years old. The dentist's first aim should be to secure the confidence and co-operation of the child, so that his visit becomes an interest, if not a pleasure.

School Age is Too Late.

A large number of those children who attend school for the first time are found to have decayed teeth. This is the universal experience of every school dental officer. These children should have received dental care two or three years earlier. Probably in no form of disease is treatment in the early stages more necessary or attended with more satisfactory results than in the decay of teeth. It is the responsibility of every parent to see that his child receives the benefit of this treatment.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N.1, Brisbane.

IN THE FARM KITCHEN.

LUNCHEON AND DINNER DISHES.

Curried Lamb and Rice Mould.

Line a small basin with rashers of bacon, then line it with 2 cups rice, previously cooked till tender in stock or water. Melt 1 heaped dessertspoon of good dripping in a saucepan, and 1 tablespoon flour, cook until brown, then add 1 teaspoon curry-powder, stir well, add 1 cup stock, salt, pepper, and 1 lb. lean minced lamb, 2 minced onions, 1 teaspoon lemon juice. Stir until well mixed, then simmer for 1 hour. Drain some of the liquid off the mince and reserve it for the sauce. Fill prepared rice mould, cover with a thick layer of rice, place in a baking tin with a little water in the bottom, and bake for forty-five minutes. Turn out carefully and serve with the sauce served separately.

Sausage and Egg Pie.

Bring 1 lb. pork sausages to boil and simmer very gently until they feel quite firm. Allow to cool, then remove skin and cut into dice. In the meantime boil 4 or 5 eggs until hard and cut them into slices. Melt 1 tablespoon butter in a saucepan, add 1 tablespoon flour, cook a little, then add 2 cups milk or white stock. Stir over gas until thickens, then add 1 dessertspoon grated onion, 1 tablespoon each tomato sauce and shredded and fried bacon, 1 cup diced potatoes, sausages, eggs, 1 teaspoon chopped parsley, salt and pepper to taste. Place in a pie-dish and cover with puff pastry and bake in a hot oven for ten minutes, then lower heat and bake for half an hour.

Vienna Steaks.

Mix together 1 lb. lean minced steak, 2 cups soaked bread, 2 teaspoons chopped parsley, 2 tablespoons grated onion, 1 tablespoon tomato sauce, 1 teaspoon Worcestershire sauce, a little ground mace, pepper and salt to taste, and, if liked, a little savoury herbs. Bind with one beaten egg and form mixture into round cakes, flatten out a little, sprinkle with flour, and fry in a little butter or good dripping. When they have all been fried, place in a baking dish or casserole dish, cover with a little sauce made by cooking 1 finely-chopped onion in the fat in which the steak was cooked; add 1 dessertspoon flour, cook a little, then add 2 cups stock or water and salt and pepper to taste. Cook for about twenty-five minutes in a moderate oven. A little scrambled egg placed on top of each steak is an improvement, as illustrated.

Baked Veal Rolls.

Cut 1½ lb. fillet veal in slices and flatten out a little. Sprinkle with pepper, salt, and a little finely-grated lemon-peel. Make a seasoning with a cup each of boiled rice and soft bread-crubs, 1 dessertspoon minced onion, 1 teaspoon parsley, pepper, salt, and a little ground mace and grated lemon rind. Bind with 1 egg and 1 dessertspon melted butter. Spread mixture on veal and roll up; fix securely with a toothpick, put the prepared rolls in an ovenproof dish, cover with thinly-sliced onion, sprinkle with pepper and salt, and a little plain flour. Pour over 1 cup water, 2 tablespoons tomato sauce, 1 dessertspoon Worcestershire sauce, and 1 teaspoon made mustard. Cover with lid and bake in moderate oven for one and a-half hours. When ready to serve, sprinkle with finely-chopped parsley.

Savoury Fritters and Bacon.

Mix together 1 cup finely-diced cold meat, 1 teaspoon each grated onion and chopped parsley, pepper and salt to taste, 1 tablespoon each self-raising flour and tomato sauce, and 2 beaten eggs. Drop in dessertspoonfuls on a well-greased hot pan, press out a little, and fry until a golden brown; turn and brown on the other side and serve with crisp bacon.

Noisettes of Lamb.

Remove the bones from as many lamb cutlets as required; flatten them out and roll in seasoned flour. Melt a little butter in a pan, add meat, and fry quickly on each side until a nice brown. Take up and place them in the oven to keep hot. To the remaining fat in pan add a little flour, pepper and salt, cook a little, then add enough water to make rather a thin sauce. Place the prepared meat back in pan, cover with a lid, and barely simmer for forty-five minutes. Too much cooking and cooking too hard will dry and toughen the meat. Dish up in the centre of dish and surround with baked tomatoes filled with creamed spinach.

Orange Tart.

Prepare and bake a tart-shell, and when cold fill with the following:—Place in saucepan 1 cup each water and orange juice, juice of 1 lemon, ½ cup sugar. Dilute 1 tablespoon cornflour in a little of the water, bring liquid ingredients to boiling point, add cornflour, and cook over a low gas until mixture is quite clear, stirring all the time. Take off the gas and add 1 tablespoon butter, a little at a time, beating it well in.

Fried Apples and Bacon.

Wash apples and cut into thick slices without peeling and fry in hot butter until a golden brown. Dish up and garnish with rashers of crisp bacon and fried parsley.

Creamed Salmon and Spaghetti.

Boil 4 oz. spaghetti in plenty of boiling salted water until tender; drain well, then place back in saucepan with 1 cup white sauce, not too thin, 1 beaten egg, pepper and salt to taste, and if liked a little curry powder. Well grease a ring mould and fill with the prepared spaghetti, then place mould in a dish of water and place in oven for about ½ hour. In the meantime, melt 1 dessertspoon butter or margarine in a pan, add 1 dessertspoon flour, cook a little, then add 1 cup milk and stir over gas until thick and smooth. Cook for a few minutes, then add 1 medium-size tin salmon. Allow to become very hot, add the juice of ½ lemon, and 1 teaspoon finely-chopped parsley. Turn out spaghetti and fill centre with salmon.

Baked Veal Cutlets with Peas.

Prepare veal cutlets as follows:—Remove bone and twist flank round thick end, sprinkle with pepper and salt and a little lemon juice, allow to stand for half hour. Now dip in egg and breadcrumbs. Place in a well-greased baking dish, sprinkle over some very fat bacon, cut into dice. Bake in a hot oven for about twenty minutes or until nicely browned. Turn cutlets and brown the other side. A little more bacon may be needed to finish the cooking, but on no account add dripping, as this spoils the flavour. Dish cutlets in a border on a hot dish and fill the centre with peas. Serve with a well-flavoured tomato sauce.

Fruit Dessert.

Hull and wash 1 punnet strawberries, dry well, and cut into four if large, and in two if small. Mix them with 1 cup tinned pineapple cubes, 3 oranges, cut in segments. Place the fruit evenly into individual glasses. Soak 1 teaspoon gelatine in ¼ cup pineapple juice, then dissolve over a low gas. When cold, add another ¼ cup pineapple juice, ½ cup orange juice, 1 tablespoon lemon juice, and ½ cup sweetened condensed milk. Beat until well mixed and beginning to set. Then add 2 tablespoons whipped cream and pour over prepared fruit. Serve with sponge fingers.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1940 AND 1939, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1940.	July, 1939.
North Coast.	In.		In.	In.
Atherton	1·13	39	0·90	0·91
Cairns	1·56	58	0·94	0·53
Cardwell	1·37	68	0·96	0·48
Cooktown	0·95	64	2·28	0·60
Herberton	0·89	54	0·63	0·32
Ingham	1·69	48	0·63	1·33
Innisfail	4·78	59	3·98	3·78
Mossman Mill	1·30	27	0·27	0·36
Townsville	0·78	23	..	0·07
Central Coast.				
Ayr	0·71	53	..	..
Bowen	0·93	69	..	0·10
Charters Towers	0·65	58	..	0·27
Mackay P.O.	1·67	69	0·04	0·35
Mackay Sugar Experiment Station	1·47	43	..	0·15
Proserpine	1·58	37	0·03	1·85
St. Lawrence	1·36	69	1·45	0·20
South Coast.				
Biggenden	1·44	41	0·35	2·64
Bundaberg	1·88	57	0·67	1·47
Brisbane	2·21	88	0·32	2·00
Caboolture	2·16	53	0·78	2·80
Childers	1·74	45	1·08	2·18
Crohamhurst	2·97	47	2·18	3·80
Esk	1·98	53	0·27	2·37
South Coast—contd.	In.		In.	In.
Gatton College	1·43	41	0·11	2·33
Gayndah	1·50	69	0·81	2·75
Gympie	2·10	70	0·93	2·81
Kilkivan	1·61	61	1·21	2·00
Maryborough	1·97	69	1·11	2·89
Nambour	2·72	44	2·86	3·41
Nanango	1·68	58	1·15	1·81
Rockhampton	1·75	69	0·61	0·45
Woodford	2·35	53	0·86	2·37
Central Highlands.				
Clermont	1·07	69	..	1·42
Gindie	1·11	41	..	1·33
Springsure	1·21	71	..	1·20
Darling Downs.				
Dalby	1·74	70	0·43	2·17
Emu Vale	1·60	44	..	1·94
Hermitage	1·69	33	..	..
Jimbour	1·54	52	0·55	1·58
Miles	1·64	55	0·44	1·66
Stanthorpe	2·02	67	0·13	1·50
Toowoomba	2·09	68	0·16	2·14
Warwick	1·83	75	..	1·50
Maranoa.				
Bungeworgorai	1·37	26	..	1·57
Roma	1·45	66	0·15	1·64

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1940.

COMPILED FROM TELEGRAPHIC REPORTS.

Divisions and Stations.	Mean Atmospheric Pressure. at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·04	77	64	80	30	55	22	228	9
Herberton	..	68	48	73	4, 5	37	18, 21	63	6
Rockhampton	30·18	75	50	78	2, 3, 30	40	13, 16, 19	61	4
Brisbane	30·23	70	48	76	30	38	14	32	5
Darling Downs.									
Dalby	30·26	68	36	76	31	25	21	43	1
Stanthorpe	..	61	28	72	30	16	20	13	2
Toowoomba	..	62	43	70	30	34	13	16	2
Mid-Interior.									
Georgetown	30·09	82	52	87	4	38	20	..	..
Longreach*	30·19	75	..	82	30, 31	32	19	..	..
Mitchell	30·25	68	31	80	31	22	16	..	..
Western.									
Burketown	30·10	82	54	87	4 5, 30, 31	45	18, 19	..	..
Boulia	..	74	41	84	28	33	18	..	..
Thargomindah	30·22	69	40	78	28	30	19	..	..

*Longreach minimum readings incomplete.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

					MOONRISE.	
	September, 1940.		October, 1940.		Sept., 1940.	Oct., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·6	5·38	5·32	5·52	4·58	5·2
2	6·5	5·39	5·31	5·52	5·45	5·48
3	6·4	5·39	5·30	5·53	6·29	6·35
4	6·3	5·39	5·29	5·53	7·14	7·24
5	6·2	5·40	5·28	5·54	8·0	8·15
6	6·0	5·40	5·27	5·55	8·46	9·8
7	5·59	5·41	5·25	5·56	9·34	10·3
8	5·58	5·41	5·24	5·56	10·24	10.58
9	5·57	5·42	5·24	5·57	11·16	11.53
					p.m.	p.m.
10	5.56	5·43	5·23	5·58	12·9	12·47
11	5·55	5·43	5·22	5·58	1·3	1·40
12	5·53	5·44	5·20	5·58	1·57	2·32
13	5·52	5·44	5·18	5·59	2·51	3·23
14	5·51	5·45	5·17	6·0	3·45	4·14
15	5·50	5·45	5·16	6·0	4·36	5·5
16	5·49	5·46	5·15	6·1	5·27	5·55
17	5·47	5·46	5·14	6·1	6·18	6·47
18	5·46	5·46	5·13	6·2	7·9	7·38
19	5·45	5·46	5·12	6·3	8·0	8·30
20	5·44	5·47	5·10	6·3	8·51	9·22
21	5·43	5·48	5·10	6·4	9·43	10·14
22	5·41	5·48	5·9	6·4	10·34	11·3
23	5·40	5·49	5·8	6·5	11·26	11·51
24	5·39	5·50	5·8	6·6	..	..
					a.m.	a.m.
25	5·38	5·50	5·7	6·6	12.18	12·38
26	5·37	5·51	5·6	6·7	1·8	1·23
27	5·36	5·51	5·5	6·8	1·57	2·7
28	5·35	5·51	5·4	6·8	2·45	2·52
29	5·34	5·52	5·3	6·9	3·31	3·36
30	5·33	5·22	5·2	6·9	4·17	4·20
31			5·1	6·10		5·8

Phases of the Moon, Occultations, &c.

2nd Sept.	●	New Moon	2 15 p.m.
9th „	☽	First Quarter	5 32 a.m.
17th „	○	Full Moon	12 41 a.m.
25th „	☾	Last Quarter	3 47 a.m.

Apogee, 3rd September, at 4.0 p.m.
Perigee, 18th September, at 6.0 p.m.

There is always a feeling of hope with September. Is it because most of the winter has passed and spring is at hand, or is it the primitive man within who, long ago, when he saw the little Pleiades, the Bull, and great Orion rising in the morning, knew that the time for sowing had come? In times past the starry heavens were the countryman's calendar, and agricultural operations were performed according to the rising or setting of certain stars. It may be, however, that the modern man knows that in September the southern Spring Equinox occurs, and the sun, which has sojourned in the northern hemisphere for the past six months, is returning to bring us the summer. On 23rd September Old Sol will have reached as far south as the equator, and as he continues his southward journey, the days will rapidly lengthen. Until now the day has been shorter than the night; on 23rd September the day and night will be of equal duration over the whole earth. After that the day will be longer than the night. Another useful and interesting observation is that only at the equinoxes the sun rises and sets due east and west respectively; it is easy then to mark the compass points on the horizon.

Everyone who was about before dawn last month must have been attracted by the brilliancy of Venus. Since then the Morning Star has climbed much higher in the sky with declining brightness. On 5th September the planet will have reached her greatest distance from the sun—46 degrees. After that, Venus will begin to sink back again toward the eastern horizon.

We have not seen Mars for a long time; a year ago he shone brighter than Jupiter now shines in the morning. On 7th June, when Venus was still the Evening Star and low in the west, she passed Mars, which appeared only as a tiny star. At the end of August Mars passed on the far side of the sun into the morning sky.

1st Oct.	●	New Moon	10 41 p.m.
8th „	☽	First Quarter	4 18 p.m.
16th „	○	Full Moon	6 15 a.m.
24th „	☾	Last Quarter	4 4 p.m.

Perigee, 2nd October, 2.0 a.m.
Apogee, 15th October, 8.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

The Year in Agriculture.

IN his annual report to the Minister (Hon. Frank W. Bulcock), the Under Secretary of the Department of Agriculture and Stock (Mr. R. P. M. Short) reviewed the agricultural position and the progress made by the rural industries during the year ended on 30th June last.

In the course of his review, Mr. Short said:—

The year in agriculture was a good one generally. An unusually wet winter succeeded by a good spring in most farming districts justified anticipations of heavy crop production, which, to a large extent, were realised.

The sugar output in Queensland during the 1939 harvesting season was easily an all-time record; 891,000 tons of sugar were manufactured from 6,040,000 tons of cane, as compared with the previous peak (1938), when 777,000 tons were made from 5,342,000 tons of cane. Notwithstanding the increased quantity of sugar exported, the average value per ton (£15 15s. 3d.) was even greater than that for 1938, and the gross value of the entire crop was over £14,000,000. The enhanced price obtained was due to the fixation of an export price by the British Ministry of Food, at which all available sugar was acquired after the outbreak of hostilities in September, 1939. The 1939-40 growing season has been reasonably satisfactory, although seasonal adversity was the experience in some areas. The estimated sugar yield for the current harvest is 820,000 tons, about 70,000 tons less than the 1939 output. Preliminary milling results indicate that the sugar content of the cane this year is above normal, so that the early estimate may be attained even though the cane yield may be reduced because of the continuance of dry weather in the Central and Southern districts.

Arrangements with the British Government will again assure the sale of the entire production, provided, of course, that shipping is available to transport the sugar to Britain and other units of the British Commonwealth which are this year participating in the Empire buying scheme.

Attention is again directed to the sustained improvement in production efficiency. The average production per acre of 3¼ tons of raw sugar is the highest figure yet atttained, and is in sharp contrast to the yield of 1½ tons, which was the standard forty years ago. This has only been achieved by the application of scientific agricultural principles, which lead to reduction of waste and costs of agricultural production generally, as well as to the improved milling technique which places the Queensland factories in the forefront of the sugar industries of the world.

For the grain-grower conditions were favourable for high yields, although late frosts of varying severity and a dry period were limiting factors. The aggregate area cropped was 360,459 acres, from which a yield of 6,751,000 bushels was obtained. Over 45 per cent. of the acreage sown was under the five best varieties of Queensland-bred wheat, selected for their rust and drought resistance. Observation and seed selection plots were established throughout the wheatgrowing areas, from which satisfactory results were obtained. A comprehensive wheat-breeding programme was continued. In the maize-growing districts, crop returns were satisfactory, and many heavy yields were harvested. On the Atherton Tableland, however, cyclonic weather and a prolonged wet season prevented the fulfilment of an early promise of a heavy harvest. Record yields and prices were the satisfactory experiences of barley-growers.

Seasonal conditions generally were not conducive to high cotton yields, and a combination of fiscal uncertainty and the lateness of planting rains caused a steep decline in production. With the renewal of the bounty on raw cotton and the rapid expansion of the home market an intensive campaign to stimulate production is in progress. As a result, a greatly increased acreage can be expected in the coming season. The merits of growing cotton under supplementary irrigation were investigated in the course of the year, and results were strongly in favour of irrigation where it can be practised economically. The value of cotton-grassland rotation was again effectively demonstrated. Further satisfactory progress was made in developing stocks of seed of the most promising varieties, and it is now possible to meet all likely demands for seed of types required by Australian spinners.

The cultivation of grain sorghums and other fodder crops continues to expand. Seed propagation plots and yield and spacing trials in practically every farming district produced gratifying results.

The tobacco yield for the whole of the State was a record, and values also were higher than ever before. Approximately 3,000,000 lb. of cured leaf, valued at £340,000, was produced from 4,530 acres, the aggregate area planted. Investigational work on insect and disease control and cultural practice was continued throughout the year and noteworthy results were achieved.

Conditions favoured peanut-growers who had a satisfactory harvest. Irrigated potato crops were much higher in yield than those in unwatered fields. During one period, market prices were as high as

£20 a ton; general average values were fair. Interest in fodder storage has increased as an outcome of well-sustained departmental effort.

Investigations bearing on the maintenance of fertility and the economic use of the land resources of the State were continued. Soil erosion, it is recognised, is of the utmost importance to the whole economy of the State. Consequently, soil conservation has claimed close attention, and the extension work of the Department in relation to soil economy has been planned in accordance with recognised principles of effective and protective land utilisation.

Favourable conditions were general throughout the fruitgrowing districts. Yields were heavy and improved prices compensated for losses from climatic causes where they did occur. Banana-growers now number 2,326, and the planted area aggregates 10,829 acres, of which 8,606 acres are in bearing. The total marketed production for the year was 550,000 cases, an acreage average of 63. Pineapple-growers also had a good year, with satisfactory returns for fresh fruit and higher prices for cannery consignments. Tropical fruit culture and vegetable growing are rapidly expanding industries in the coastal regions of the Central Division. Citriculture also is extending in inland districts, especially in the western country. In the deciduous fruitgrowing districts, production and prices were satisfactory, and marketings compared favourably with those of the previous year. Losses from pests were not serious, and fruitfly particularly was less in evidence than usual.

Increasing areas of production and more diversified cropping continue as a characteristic of the fruit industry in Queensland.

The activities of the Plant Industry (Research) Division continued as among the chief bases of the development of the primary industries. A wide range of investigational work was done in relation to the control, by both biological and mechanical means, of insect pests and plant diseases. The services of the Division have been extended to many important problems and to the improvement of technique in relation to those problems. The flow of reliable scientific information from the research worker through the departmental extension services to the producer continued evenly and in appreciable volume throughout the term. The application of the results of investigations has continued systematically and effectively in co-operation with the field officers of the several branches of the Department. It is considered that direct personal contact through the instructional staffs is, when practicable, the best way of conveying the results of research to the farmer. The establishment of experiment and demonstration plots in various districts is another valuable form of extension work which was applied with advantage in the course of the year.

Dairy Production.

ALTHOUGH dairy production was about 10 per cent. lower than the record output of the previous year, the return of approximately £9,000,000 was only 8 per cent. less. The Australian championship for butter quality was gained by a Queensland factory—Nanango—for the first time, and the quality of the factory output as a whole was maintained at a high standard. The beneficial influence of the use of steam sterilisation in dairy plants has already become manifest in higher quality production. The output of butter for the year totalled 139,795,042 lb., of which 72·6 per cent. was exported and 4 per cent. was sold in other States. The production of cheese, in which there was a marked improvement in quality, totalled 13,841,405 lb.

Plant-Breeding and the Production of Better Seed.

L. G. MILES, B.Sc.Agr., Ph.D., Research Officer.

THE need for planting better seed cannot be emphasised too strongly in Queensland to-day. The use of cheap, inferior seed may mean an initial small saving to the farmer, but it represents, in the long run, very poor economy. The fact is lost sight of that better seed gives better germination, greater freedom from seed-borne diseases, increased yield per acre, and better quality, and, therefore, more efficient production. The cost of producing a crop may be apportioned under the headings of the purchase or rental of the land employed to produce the crop, and the cost of such fertilizer and lime as may be used, together with the time and money expended in preparing the land, and in sowing, harvesting, and marketing the crop. The difference between the return from the crop and the cost of production represents the profit to the farmer. If, by using better seed, the yield is increased by, say, 20 per cent., the costs of seed, harvesting, and marketing are increased, but the other costs remain unaltered. The excess, therefore, of increased return over increased cost of seed, harvesting, and marketing represents additional profit to the farmer. Improvement of quality may be still more valuable, as increased monetary returns therefrom should be obtained without any increase in the cost of production apart from the additional cost of the seed.

One purpose of this article is to demonstrate the value of plant-breeding work, particularly selection, in the production of new varieties, and in the maintenance of existing ones. It also outlines the methods by which this is accomplished, and shows how farmers may, in some cases, profitably devote some time and trouble to the selection of their seed. With certain crops, such as cotton and tobacco, where a State-wide standard of quality is sought, the Department of Agriculture and Stock definitely prefers to handle the production of seed for general sowings. With many miscellaneous crops, however, in which the farmer commonly saves his own seed, some attention to intelligent selection will be amply repaid.

METHODS OF REPRODUCTION OF CROP PLANTS.

Before attempting to breed a new variety of, or otherwise improve, any species of farm crop, vegetable, or garden plant, it is essential to know something of the mode of reproducton of such species under natural conditions. Most Queensland farm crops, with the important exceptions of sugar-cane and potatoes, are reproduced by means of seed. Such seed is formed as a result of the pollination of a female reproductive organ, known as the pistil, with pollen from the male organs or stamens. In many cases the pistil and stamens are enclosed together within the petals of a typical flower, while in other cases the flower may be extremely modified, as in wheat or oats, or again the pollen-producing and seed-producing organs may be on different parts of the plant, as in maize.

Crop plants such as wheat, barley, oats, tobacco, tomatoes, peas, and beans, have flowers in which the stamens and the pistil grow close together. In some cases the anthers, which are the essential parts of the stamens, burst and shed pollen before the flower has completely opened; in others, the anthers may more or less cover the pistil until after they have shed their pollen, even though the flower may have opened. In all these cases, therefore, flowers are naturally pollinated with their own pollen, or, as is said, self-fertilized. Occasionally pollen grains from other plants may be carried in the air or by insects and find their way to the pistil of a plant before its own pollen has been shed. This is rarely the case, however, with the above plants, and under normal climatic conditions over 98 or 99 per cent. of the seeds formed by such plants are the result of self-fertilization.

Another group of plants, including sorghums, lucerne, cotton, and some grasses, are largely self-fertilized under natural conditions, but also undergo a considerable percentage of cross-pollination—i.e., fertilization with pollen from other plants in the neighbourhood. In the case of this group, the flowers are similar in general structure to those of the previous group, but some factor or factors tend to promote cross-pollination. Thus the anthers and the receptive surface of the pistil may not be closely associated, as in cotton, or there may be some peculiar mechanism for the liberation of pollen, as in lucerne, and insects may play an important part in transmitting pollen from one plant to another.

A third group of plants is characterized by the fact that cross-pollination is the rule rather than the exception, and self-pollination occurs only to a very small extent in the field. Maize, rye, pumpkins, cabbage, many fruits, and certain grasses and clovers belong to this group. The reason for the predominance of cross-pollination in the case of maize can be readily observed. At tasselling time the slightest breath of wind liberates the pollen from all mature tassels, and the air is filled with a mixture of pollen dust from a very large number of plants. This mixture is continuously falling on exposed silks, and effecting fertilization, with the result that over 90 per cent. of the grains of an ear may be the result of foreign pollination, and only a small percentage the result of fertilization with pollen falling from the tassel of the plant bearing that ear. Other species of plants of this third group may be sterile to their own pollen, i.e.. they fail to set seed when self-pollinated but are fertile to pollen from other plants of the species; others, again, mature their stamens before their pistils, or vice versa, and in such cases cross-pollination must of necessity predominate. Wind and insects are the two main factors in distributing the pollen from plant to plant.

A fourth small group have their male and female flowers on different individual plants. Such plants cannot be self-fertilized, since a "female" plant produces no pollen, and must be fertilized with pollen from a "male" plant. Included in this group are the date palm and hops of commerce.

It is well known that a variety of wheat may be kept reasonably pure for a number of years, while a variety of maize, pumpkin, or sorghum, in a very short time, may begin to degenerate and lose type altogether. The two main causes of such "degeneration" are natural crossing with other varieties and accidental mixing of seed. With wheat or barley two or more varieties may grow side by side in the one paddock without fear of cross-pollination rendering them impure. Indeed, plant breeders often grow single rows of wheat varieties or strains side by side, and the small amount of cross-pollination occurring is generally not sufficient to materially affect the purity of the seed. The great point to be observed in keeping such varieties pure is to prevent mixing of the seed. Plant-breeders accordingly harvest their rows separately, and thresh the ears either by hand or by simple machines that can be easily cleaned. Most farm threshers are very difficult, if not impossible, to thoroughly clean in a short time. Any farmer desirous of saving his own seed for planting should, therefore, run off a number of bags of the variety which he is threshing or harvesting, in the case of the complete harvester, before he begins to set aside his planting seed. This procedure will afford an opportunity for seed of other varieties, lodged in cracks and corners of the machine, to be dislodged and removed and the varietal seed saved for planting will, therefore, be reasonably pure.

With maize, on the other hand, the growing of one variety near another will allow of a considerable amount of cross-pollination, unless the two varieties silk and tassel at entirely different times. If an early-maturing variety of maize be grown alongside a late-maturing one it is possible that the former may have completely finished shedding its pollen, and that its silks may have completely died off before the latter has commenced to flower; in such a case the seed of each variety will be uncontaminated by crossing with the other. The same protection may be afforded in cases where one of two varieties which would normally tassel at the same period is planted considerably in advance of the other.

In the United States of America, a distance of a quarter of a mile is considered by many as the *minimum* safe distance for a seed plot from other fields of maize, especially if the direction of the prevailing wind is from the other fields towards the seed plot. Smaller distances may be used, however, if windbreaks intervene, such as narrow belts of timber. If, on account of space considerations, the seed plot has to be planted closer to another variety than is desirable, planting seed should be obtained from the middle of the plot, if it is a large one, or from the side furthest from the other variety unless, as previously stated, the periods of flowering of the two varieties have not overlapped.

Occasionally the effects of crossing may be noticed in the harvested seed. Thus, if a farmer is harvesting seed of a white maize that has been grown in close proximity to a yellow variety, the appearance of yellow grains on the ears will indicate to him that out-pollination has occurred. If, however, he is harvesting seed from a yellow variety that has been growing near a red maize, such as Red Hogan, he will not be able to detect out-pollinated grains, as they will all appear yellow, like the original variety. In the next generation, however, the effects of the crossing will be seen, for plants which have grown from grains resulting from cross-pollinations between the two varieties will produce entirely red grain. Mixtures of this type in maize are very difficult to eliminate, as, even if red-grained ears are culled out each year from a yellow maize variety, the pollen from the plants producing them has pollinated a number of other plants, and will make its effect felt in future generations. The best procedure is, therefore, to take a little extra trouble in buying or producing the seed, thus eliminating contamination from the start. Here, again, as with other crops, great care must be taken in shelling if varietal mixtures are to be prevented.

Sorghum and cotton, though mostly self-fertilized, are subject to a considerable percentage of cross-pollination through insect activities. Such natural crossing, which may result in up to 6 per cent. of the seed of sorghum and 15 per cent. of the seed of cotton being capable of producing hybrid plants, is sufficient to cause rapid contamination of a variety if it is grown adjacent to other varieties, without any attempt being made to protect the heads or flowers from cross-pollination. With cotton, isolation of varieties is the only logical method of preventing contamination, though the mixing of seed at the ginneries is a potential source of trouble that has always to be guarded against. The position has been met in some countries by the establishment of "one-variety" communities. If such a scheme is strictly enforced there is no fear of cross-fertilization with other varieties or of contamination of seed occurring at the ginnery serving each one-variety community.

Sorghum plants produce a considerable amount of seed per seed head; it, therefore, pays, with this crop, to produce seed "under bag" if there is any danger of the variety being cross-fertilized by others in the neighbourhood. A grocer's brown paper bag may be used for each plant selected for seed purposes; it should be large enough to completely enclose the mature head without fitting too tightly. The head is enclosed in this bag just before the pollen is shed, and the mouth of the bag is tied with string round the stalk just below the head. The bags are opened a week or so later, after pollination has run its course, to give the heads access to air and light, but the plants must be tagged in some way so as to be recognised at harvesting.

Tobacco, though normally cross-pollinated to only a slight extent, must be similarly protected if other varieties or even off types within the variety itself are nearby. The enormous amount of seed produced by a single flowering head of tobacco makes it economical, as well as desirable, to produce the seed under bag.

With vegetatively propagated crops such as sugar-cane and potatoes, the problem of pollination does not arise in farm practice. A variety, for example, of potatoes normally descends from a single plant or a single tuber, and if care is taken in keeping varieties separate there is no danger of contamination. Occasionally, however, in that crop "bud sports" occur spontaneously, i.e., owing to causes still little understood, certain buds of the one tuber or certain tubers of the one plant may produce shoots different from the varietal type, which in turn may develop distinctly different tubers. These "sports" will propagate themselves true to type, and may be either rogued out from the crop, if undesirable, or selected as a new variety if showing improvement over the original variety. A number of commercial varieties of potatoes have originated accidentally in this way.

Two main causes of degeneration of crop varieties have been described, namely, accidental mixing of seed and natural crossing with other varieties. A third cause of such "running-out" may be cross-pollination between plants of the variety itself. This cause would naturally be important only in the case of crops like maize, which are normally cross-fertilized, and cotton and sorghum, in which cross-fertilization plays a lesser, but still important, role. Very few varieties of such crops are genetically pure when released by the plant breeder, and natural crossing between plants of somewhat divergent types tends to increase the multiplicity of forms present in the variety. This process not only decreases the uniformity of the crop, but may also result in a lowering of the average yield and quality.

It is thus obvious that some means must be employed to maintain varietal standards in crops subject to cross-pollination by insect and other natural agencies; otherwise varieties tend to "slip back" in quality and productivity. The methods generally adopted to effect this purpose are mass selection and pedigree selection. These methods, together with a third, that of hybridization, are also used by the plant breeder in the breeding of new and better varieties of crop plants.

MASS SELECTION.

Of the various methods of plant improvement, practically the only one available to the farmer is that of mass selection. This comprises the selection of superior plants of a type for seed purposes, and the bulking of the seed from these plants to sow the following crop. This method is used not only in the production of improved strains but also in the maintenance of those already available.

Practically any crop grown in Queensland to-day will show a large amount of variation from plant to plant, these variations arising from two sources. They may be due either to inherited differences or to differences in the soil and in the treatment to which the plants are subjected. Take for example, a maize plant, which is outstandingly better than any other plants in its neighbourhood. This advantage may be due to a greater inherent yielding ability, a characteristic which it can transmit to its progeny, or may simply be due to the fact that this plant grew on a more fertile patch of soil than its neighbours, that it had less competition from weeds during the early stages of growth, or was in some other way favoured by its environment. If favourable environment was the factor responsible for the outstanding merit of this particular plant, then the farmer cannot expect its high yielding ability to be transmitted to its progeny, unless each and every one of them is grown under similarly favourable conditions. Sometimes a plant will be well developed and yield well, because it has no immediate neighbours, and, therefore, more space is available for root development. Such a case can be easily detected. In other cases, however, it is impossible to tell from inspection whether a fine-looking plant is of a superior strain or whether it is merely favoured by environment. If, however, plants of ideal type are selected, and harvested and threshed separately for seed purposes, at least no harm is done, and the probability is that the strain is being improved. Yield, of course, is not the only consideration in selection. Such points as a suitable height of plant, the method of carriage of the ear in maize, the strength of the straw or stalk in maize and the small grains, the size, shape, and texture of the leaf in tobacco, and of prime importance, freedom from disease, should be given careful attention. It does not follow that plants which are free from disease are resistant to disease, or that in selecting disease free seed the selector is breeding for disease resistance. Seed, however, which is free from disease, stands a much better chance of germinating and of producing vigorous plants than diseased seed. If, therefore, selection were based solely on freedom from disease, the farmer would still be benefiting each season's crop, though possibly not effecting any permanent improvement in the crop.

Maize offers an excellent opportunity for selection on farms. Farmers should familiarise themselves with the appearance and characteristics of the variety or varieties which they are growing. Plants should be selected in the field, their ears harvested separately and subjected to a further selection in the barn. Selected ears should be shelled separately and the grain used to sow a small isolated seed plot which will provide seed for larger plantings. Since each good ear selected provides a considerable amount of grain, it is quite practicable for most farmers to select their own seed and sow their own increase plot each year.

The mass selection of a crop such as wheat requires more time and trouble since it is difficult to separate and study individual plants in the field, and a much larger number of plants are required to produce a bushel of seed than is the case with maize. Offsetting this disadvantage is the fact that wheat, being self-fertilized, requires less attention in order to keep varieties pure and to maintain varietal standards. If, however, a variety shows a falling off in yield or shows evidence of variation, e.g., by the appearance of bearded heads in a beardless variety, compact ears in a loose-eared variety, or *vice versa*, there is urgent need for selection. Individual plants which are true to type should be selected prior to harvest or individual ears should be chosen, if the plants cannot be separated, and the seed threshed out by hand. Sufficient seed should be obtained to hand-plant a small plot the next year. This plot should be rogued of off-types, if present, and used for seed purposes. In this way in a few years, sufficient improved seed will have been produced to plant the farmer's bulk fields. Care, of course, must always be taken at harvest to keep this selected seed free from mixtures, or otherwise the work is largely nullified. Such work, it must be admitted, comes more within the scope of the Department of Agriculture and Stock than of individual farmers. Signs of contamination have recently been noticed in a number of the major wheat varieties in this State. A programme is therefore being put into effect whereby selection and rogueing will be carried out by that Department, an increased supply of pure seed thus being made available through the agency of the Wheat Board.

Self-fertilized seed of tobacco, cotton, sorghum, and many other crop plants is usually obtained simply by covering the flowers or flowering heads with a bag, or some other protective cover to prevent the entrance of foreign pollen. In the case of tobacco and cotton, however, quality is of such prime importance and yet so difficult to determine, that farmers

Plate 80.
SORGHUM BREEDING PLOT AT THE BILOELA RESEARCH STATION.

Plate 81.
COTTON PROGENY ROW BREEDING PLOT AT THE BILOELA RESEARCH STATION.

are not encouraged by the Department of Agriculture and Stock to produce their own seed. Selection for productivity and vigour alone may be quite successful in improving the crop yield but quality may be so impaired that the resulting strains are almost valueless. Departmental officers are therefore employed to select seed from these two crops with a view to improving or maintaining both quality and yield. This work is being carried out annually and the seed stocks thus obtained are made available to farmers growing these crops.

Departmental work with sorghum (Plate 80), especially the dwarf types of grain sorghum, is now being directed towards the improvement of yield and uniformity in a number of promising types introduced from overseas. Where farmers are, however, desirous of producing their own seed on the farm, the extra time taken to select and tag uniform, vigorous plants, typical of the variety, for seed will be repaid. The heads on such selected plants should be bagged, as previously described, in order to prevent cross-pollination with other varieties in the neighbourhood, or with inferior plants in the same field.

PEDIGREE SELECTION.

The method of selection usually practised by plant breeders is the pedigree, or plant-to-row method. Using this method, a number of plants of superior type are selected as in the ordinary method of mass selection. Seed of each plant is kept separate, however, and a separate row is sown next season from the seed of each selected plant. If one of the parent plants showed up well merely on account of rather favourable environmental conditions, its progeny row will not appear to such advantage. The inherent value of the selected parent plants is thus judged, not so much on their own appearance as on the appearance of their progeny rows. If the best progenies still exhibit variation, further plants are selected and the process continued until a number of uniform progenies are produced. These lines or strains have now to be tested against each other in carefully conducted trials over a period of a few years to determine the best, which is then increased for commercial seed production (Plate 81).

HYBRIDIZATION.

Hybridization is at once the most difficult and the most promising method of plant improvement. Selection of itself cannot introduce anything new into a variety; it can only pick out the best that is already available in that variety. If one variety of wheat possesses rust resistance and low breadmaking quality, while another is rust-susceptible but of high quality, the only logical method of obtaining a high quality, rust-resisting wheat is by crossing the two varieties. In crops possessing normal, perfect flowers, i.e., flowers with both stamens and pistil, the anthers must be removed, using a fine pair of forceps, from the flowers which it is desired to cross-pollinate. This removal is effected just before the anthers have shed any pollen, which is usually as they are turning colour from green to yellow, or whatever the colour of the ripe anther may be. These flowers are thus rendered incapable of self-pollination. They must then be covered by suitable bags to protect them from any pollen which is in the air or which may be carried by insects. At a suitable period, usually within a day or two, pollen is taken from the other parent and applied to the stigmas of the treated flowers, over which the bags are then replaced. The hybrid seed when sown normally produces a uniform lot of plants from which seed is obtained for the next generation. This generation, the "splitting" generation, generally provides a great variation in types, and from it plants possessing the desired combination of characters are selected. These plants are subjected to a process of progeny selection until uniform, true-breeding strains are obtained. (Plate 82.)

Plate 82.

Hybridizing Wheat.—A tagged plant may be seen with the ear covered to prevent the entry of unwanted pollen from outside. Forceps are being used to remove the anthers from another ear.

VARIETAL TESTING.

Hand in hand with the production of new varieties, and the improvement of existing ones, must go a programme of varietal testing. Until a new variety or strain has been tested in the field alongside the best types already available, its actual value for a certain district cannot be determined. Again, with certain crops upon which plant breeding work is not being carried out at the time, the problem still arises of determining the most profitable varieties to grow in the various districts. Varietal trials with this object in view have been conducted in the past, and a still more comprehensive series of such trials is now being undertaken. The results of these trials are published when available, and farmers are advised to make use of the information obtained from them when choosing the varieties to grow on their own properties.

Should a farmer desire to test the merits of several varieties of a crop, it is suggested that information regarding the most suitable method to employ be obtained from an appropriate field officer of the Department of Agriculture and Stock, stationed in the farmer's own district; if no suitable local officer is available, then the farmer should communicate with the Department of Agriculture and Stock, Brisbane. Attempts are frequently made to test varieties by planting a single area of each, or even by comparing the results obtained in one season with those realised in previous seasons, using different varieties in each season. The yields of single plots of each variety are, however, often not indicative of the relative merits of the varieties tested, and the results obtained in comparisons of varieties grown in different seasons are likely to be even less reliable. Careful investigations conducted in this State and in other countries have shown that great care should be exercised in carrying out varietal tests. Not only have several plots of each variety to be planted in the one experimental block, but care must also be taken to guard against any variability of the soil or slope of the field affecting the results obtained. As already indicated, the Department of Agriculture and Stock is only too pleased to give advice to farmers who intend testing varieties so that the design of the farmer's experiment may be such as to yield the fullest and most reliable information.

A NATIVE COUCH GRASS DANGEROUS TO STOCK.

Since January, 1939, over 1,100 sheep have died in one locality, apparently because of eating some poisonous plant. As many deaths were reported in April of this year, Mr. W. D. Francis, Botanist, made an examination of the area. He found that a native couch grass, *Brachyachne convergens,* was the cause of the death of the sheep. The presence of a prussic-acid-forming substance in this grass was first detected during the investigation in the field. When the green parts of the grass were broken in the hands they gave off the characteristic almond-like odour of prussic acid. A sample of the grass, which was brought to Brisbane and tested in the laboratory of the Agricultural Chemist, gave pronounced reactions of a prussic-acid-forming glucoside.

The rapidity of the deaths and the post-mortem results observed by Mr. Ohman, Government Veterinary Surgeon, are apparently consistent with prussic-acid poisoning. Other features of the native couch grass, such as its frequency in the locality referred to and the extent to which it had been eaten, are also consistent with the view that it was the cause of the death of the sheep.

This is the first occasion on which this grass has been found to yield prussic acid. As its common name suggests, it is allied to the common couch grass which is frequently found along bore drains in Western Queensland. Generally, the native couch can be distinguished from the common couch by its larger size and paler colour and by the fact that it is not confined to bore drains and other moist localities in western parts of the State.

Native couch has been recorded from many localities in the Gulf country, from Hughenden, Aramac, Clermont, Emerald, Milmerran, and St. George. So far we have not received it from south-western localities beyond Roma and Barcaldine in the Central Division. It also has been recorded as occurring in Northern Australia and Western Australia.

Occasionally, native couch grass is referred to as star grass. The Star grasses, however, are of the Rhodes Grass type.

By far the heaviest loss of sheep in the locality referred to occurred with a flock which had travelled over a route which was fairly bare of feed for 7½ miles before reaching the locality. From this experience, it appears that empty sheep which have been driven over a bare route are much more susceptible to poisoning than sheep which have passed over a route carrying good feed.

A sample of the native couch grass collected at the location where the sheep losses occurred was analysed in Brisbane by Mr. McKechnie, Acting Senior Analyst, who found in the sample submitted 66·7 milligrams of hydrocyanic acid (prussic acid) in 100 grammes of grass as received. This amount is more than three times that usually considered as dangerous in plants eaten by stock and cannot be considered as representing the total amount of hydrocyanic acid present in the grass when eaten by the sheep, for during transport to Brisbane a considerable amount of hydrocyanic acid must have been lost by volatilisation.

The Poison Plants Committee of the Department of Agriculture and Stock is arranging for the analysis of samples of native couch grass collected from different districts in order to ascertain the hydrocyanic acid content of this grass when grown in different localities.

Skeleton Weed.

SKELETON Weed (*Chondrilla juncea*) is the most serious weed pest with which wheat-growers in New South Wales have to contend. Officers of the Department of Agriculture and of the Rural Bank of that State regard it as the worst agricultural weed ever encountered in this country. It is a native of Central Asia, and has spread to southern Europe and North America. So far no specimens have been received by the Queensland Department. The Government Botanist, Mr. C. T. White, advises that he has several times received specimens of chicory (*Cichorium Intybus*) which farmers thought might be Skeleton Weed. Chicory, which is grown in Europe as a salad and for its tap root which is roasted and ground as an adulterant of coffee, deteriorates in the wild state, and becomes simply a weed pest. It is not a very persistent weed, however, and in Queensland, at least, is subject to the ordinary field methods of control. It is superficially like Skeleton Weed, but can be identified by its blue, not yellow, flowers.

To enable farmers to distinguish Skeleton Weed should it make its appearance in Queensland, the following illustration and description, taken from the publications of the New South Wales Government, are given.

If any farmer or pastoralist suspects that this plant has made its appearance on his property, he is asked to send specimens at once to the Government Botanist, care Botanic Gardens, Brisbane, for identification. It may be pointed out that the Botanical Branch is always willing to name and report on any specimens of weeds or other plants forwarded.

Description.

"In the early stages, the plant somewhat resembles a dandelion, but a fleshy tap-root, which grows straight down to a depth of 5 or 6 feet, is very quickly established, and some three to four months later the skeleton-like top growth is made, reaching a height of from 2 to 4 feet. When the plant is nearing maturity, the early rosette formation of leaves dies, leaving only this top growth. The normal period of growth commences during May, and continues until mid-spring, when the vigorous top growth is made, ending with profuse flowering and seeding during the latter portions of the summer. The top growth then dies back, but the root is of a perennial nature, and fresh growth is made from the old root the following autumn.

"The basal portion of the stems has a thick covering of bristles or hairs. The flowers are borne singly, and are conspicuous by their yellow colour. They are normally borne on the upper portion of the plant, but when heavily grazed or cut, they will form right on the ground, an important point in the control of seeding, in which the plant shows remarkable vigour.

"Occasionally, especially after interference of the plant with machinery or chemicals, side roots are formed. It is the pertinacity of the root growth which makes control such a difficult problem, cultivation tending to stimulation and multiplication of the weed."

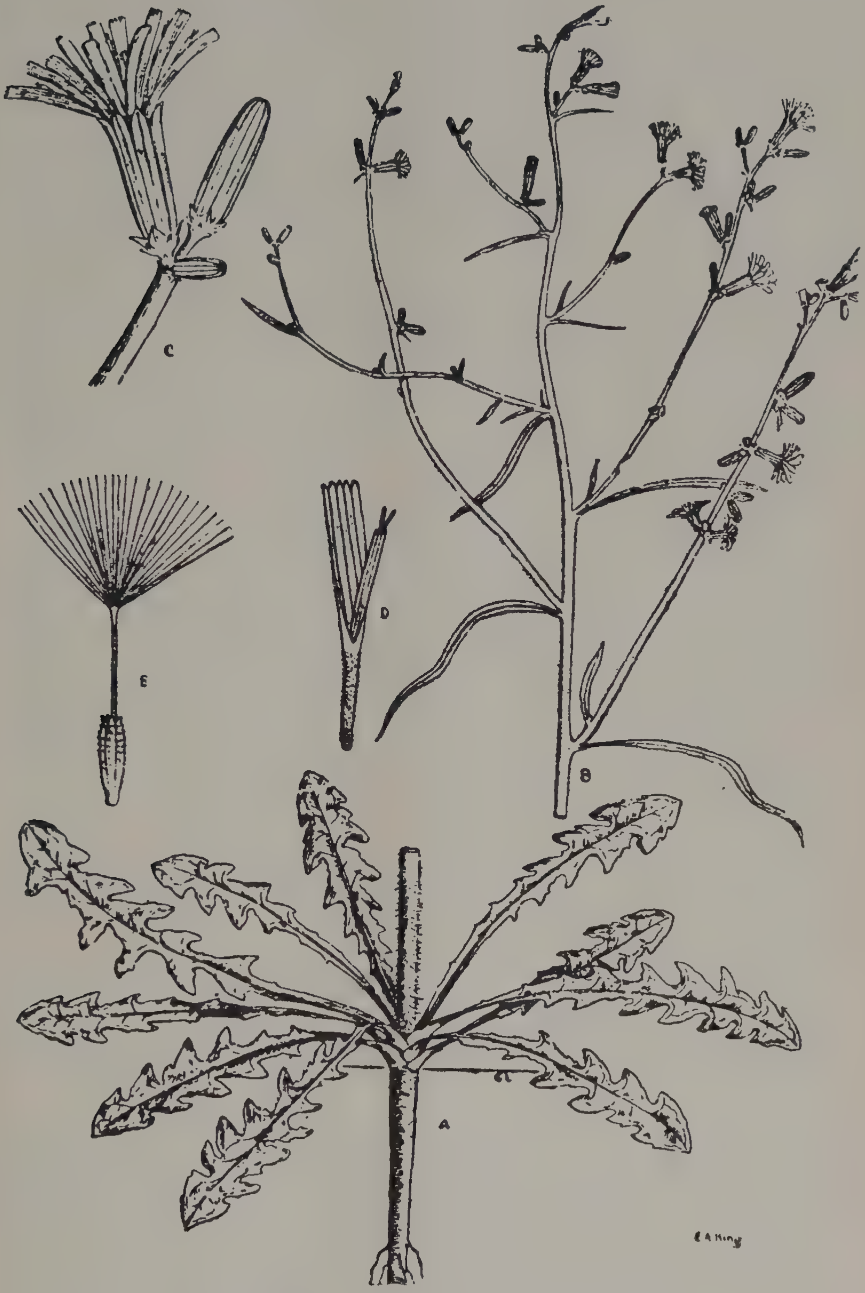
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Plate 83.

Skeleton Weed (*Chondrilla juncea*).

Steam Sterilisation in the Dairy.

L. E. NICHOLS, B.Sc.Agr., Dairy Technologist.

THE recent amendment of *The Dairy Produce Act* in respect of steam sterilisation as an essential requirement where machine milking is practised justifies publication of the original experiments on the Downs, as an illustration of its practical importance and value to the industry.

Exhaustive scientific and bacteriological tests by officers of the Dairy Branch of the Department of Agriculture and Stock associated with the cheese industry on the Darling Downs over a period of eighteen months have revealed that practically 90 per cent. of bacterial contamination causing defective quality is of utensil origin, principally from milking machines.

Bacteriological Justification for Improvement in Methods.

An average of the results of tests obtained particularly over the first three warm weather months of this year, when cheese quality was dominantly poor, revealed 88 per cent. of milk supplied to factories of unsatisfactory quality for first-grade cheese manufacture. These grading standards were observed on a combination of tests, notably the modified methylene blue reductose test, the sediment test, the Wisconsin curd test, and direct microscopic observations revealing gassy, digested, slimy, fruity, and fermented curds, below a two hours modified reductose test and with an average bacterial count up to 20,000,000 per c.c., all dominantly of utensil origin.

These tests and results are what may be described as a mass confirmation of the original bacteriological tests of methods applied on an average Downs dairy, after the usual methods of cleansing and so-called "sterilising" had been applied.

Method of Testing.—Sterile water rinses were used in the initial tests and for the final official test. The first milk rinses along milking machine lines, milk trays, separator, and cream can were taken. Notice of tests was given about three days before investigations at farms chosen previously.

After notification, samples were taken under sterile conditions *before and after treatment,* the time elapsing between the first and second sampling three days. Temperatures and weather conditions were carefully noted over the period of tests. All samples were taken both *before* and *after* the addition of improved methods of steam sterilisation—packed carefully in ice and returned to the laboratory where they were analysed bacteriologically the same evening of sampling.

All samples were tested on standard Agar media, litmus, milk, and in brilliant green bite salt lactose media. All plates were incubated forty-eight hours at 37 deg. C., and bacterial counts made with comparative determinations.

After the ordinary methods of farm cleansing were applied, samples taken to illustrate utensil infection were revealed as follows, with comparative tests after steam sterilisation procedures:—

Bacterial Counts.—Incubated forty-eight hours, standard Agar.

INOCULATED LITMUS MILK AND BRILLIANT GREEN DURHAM TUBES.

1st Rinse through machine milk line	(A)
2nd Sample Can 4 gals. milk	(B)
3rd First Rinsings Can through Separator	(C)
4th Sample Cream 1st Cream Can	(D)

Results—1st Set.

——	Before Steam Sterilisation.	Coli.	After Steam Sterilisation.	Coli.
2 minutes wet steam sterilisation in morning for afternoon milking—	Per c.c.			
Milk (A)	1,250,000	Neg. 1/100 c.c.	208,000	Neg. 1/100 c.c.
Milk (B)	1,265,000	Neg. 1/100 c.c.	84,000	+ 1/100 c.c.
Cream (C)	1,110,000	Neg. 1/100 c.c.	60,000	Neg. 1/100 c.c.
Cream (D)	1,160,000	Neg. 1/100 c.c.	60,000	Neg. 1/100 c.c.

FROM UDDER DIRECT 300 PER C.C.

	A	B	C	D	Acid.
Litmus milk—					
Before	a/d	a/d	a/d	a/d	Digestion
After	Inert	Inert	Inert	Inter	..
Durham tube—					
A	Neg.	Neg.	Neg.	Neg.	..
P	Neg.	+	Neg.	Neg.	

Results—2nd Set.—Udder Sterile.

——	Before Steam Sterilisation.	Coli.	Litmus Milk.
2 minutes wet steam sterilisation just prior to milking—	Per c.c.		
Milk (A)	1,394,000	+ 1/100	a/g acid/gas
Milk (B)	2,500,000	+ 1/100	a/g acid/gas
Cream (C)	770,000	+ 1/1,000	a/g acid/gas
	After Steam Sterilisation.		
Milk 45 minutes after start of milking through machines—			
Milk (A)	1,200,000	Neg. 1/100	Inert
Milk (B)	All sterile	..	..
(C)	..	..	..

In the first set of results were seen the aspect of the personal element as affecting the efficiency of the sterilising procedures and the inefficiency of the cleansing procedures before sterilising. This is followed by a recontamination in between milkings and its relation to dairy hygiene.

The second set reveals efficiency in all divisions of the technique.

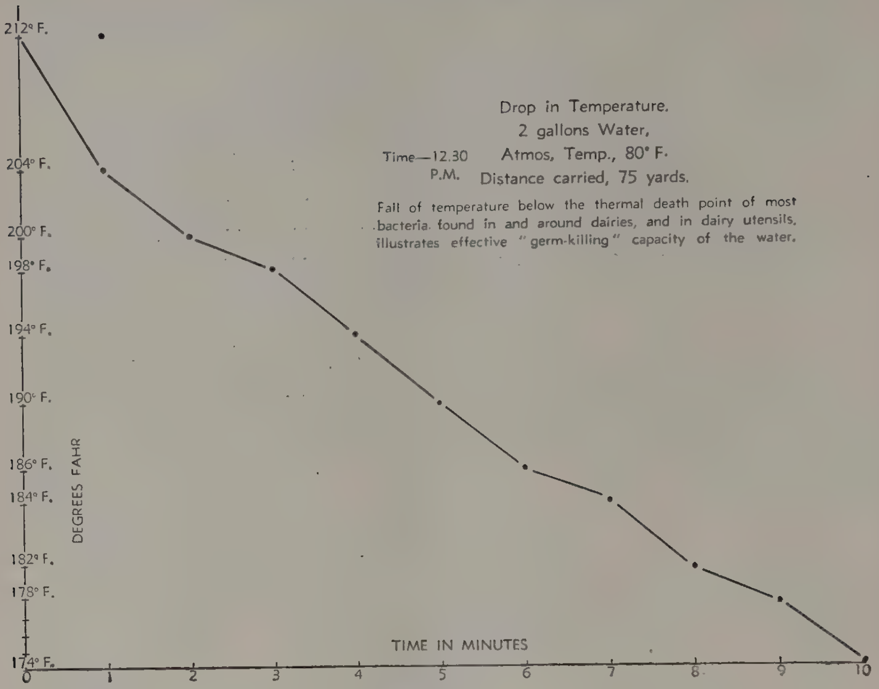


Plate 84.

EXISTING METHODS DEMONSTRATED UNDER LOCAL CONDITIONS—Water Temp. at Copper 202° F. 2 gallons carried distance 75 yds. at amos. Temp. 80° F. Dropped to 190° F. Left further 15 minutes to half an hour in dairy before final use.

Photographic Evidences Reveal Conditions Before and After Treatment.

The graph indicates the drop of temperature revealing the ineffective germ-killing capacity below the thermal death point of most dairy bacteriological studies, and reproduced in photograph of a polluted "allegedly" clean can rinse of quality-affecting bacteria.

Just as with pasteurisation of milk, maintenance of temperatures at 145 deg. F. for thirty minutes is necessary for destruction of most disease germs, so for commerial sterility of dairy equipment and milking machines and utensils a temperature of 210 deg. F. on the Downs held for two to three minutes is essential. The most effective method of destruction of these organisms, by maintaining temperatures above their heat death point, is by *wet steam sterilisation.*

Having proved the need for greater appreciation of what actually constitutes *"bacteriological cleanliness"*—by addition of improved methods of wet steam sterilisation and dairy hygiene in individual dairies—*extension of the technique to a group of cheese factory suppliers was desirable* to determine the extent to which the whole of the milk supply quality and ultimate cheese quality could be improved.

An average factory was taken, which had been producing consistently a poor-quality milk supply and a second-grade cheese, and an extension of the fundamental principles of the technique was inaugurated.

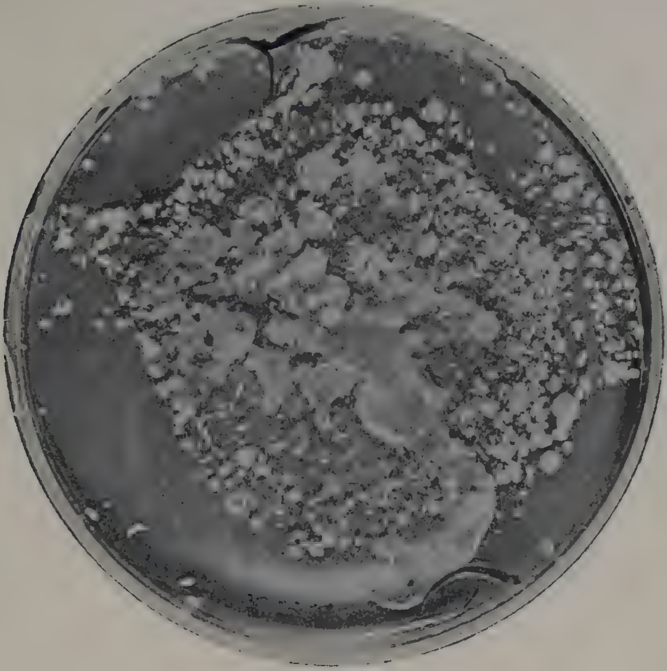


Plate 85.
Polluted Allegedly Clean Can Rinse of Quality-affecting Bacteria.

Plate 86.
Plate Exposures in Dairy, Illustrating Contamination by Air-borne Bacteria about the Dairy.

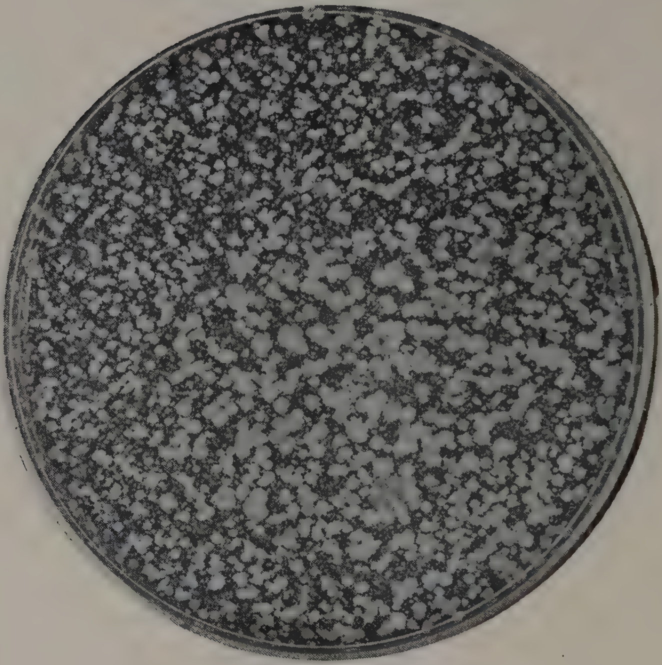


Plate 87.
YEASTS ISOLATED FROM WHEY IN MILK CANS.

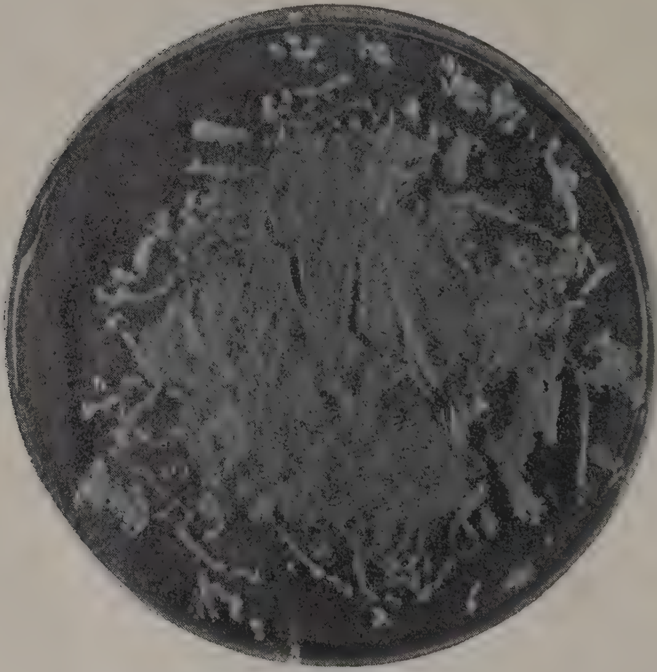


Plate 88.
IMPRESSION OF ALLEGEDLY CLEAN UDDER CLOTH.

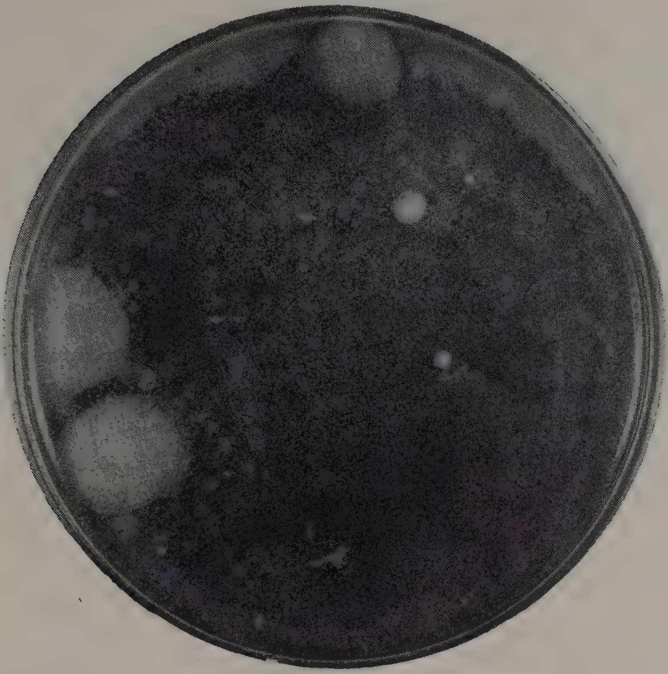


Plate 89.

Polluted Water Supply in Tank adjoining Dairy used for Cleansing of Dairy Equipment.

Each supplier to this factory was provided with or advised on a suitable cleansing technique with the approved method of wet steam sterilisation.

The Technique.

The extension of the principles to each individual supplier, involving an educational or instructional campaign over a period of three months, finally gained a full appreciation by all suppliers of what constitutes a perfect cleansing technique, effective and efficient sterilisation, and perfect "bacteriological" cleanliness with approved dairy hygiene.

A specialised technique of dairy hygiene is essential to overcome the personal equation factor in the extension of knowledge of the principles involved. Success following adoption of the principles depends on the individual and the extent to which he is prepared to follow, as well as understand, each step of the operations; and yet the application of one practicable to all dairymen.

It involves three distinct things—

1. Dairy hygiene.
2. Cleansing technique.
3. Steam sterilisation.

All three are inter-related, and the perfection or efficiency with which one is accomplished governs the efficiency of the other. Hence the need and adoption of a specialised technique.

Plate 90.

Before Sterilisation.—Milk direct from udder (Sterile) following rejection of foremilk after careful washing of udder with a weak chlorine solution.

Plate 91.

After Sterilisation.—Milk from can which had been sterilised with wet steam for two minutes.

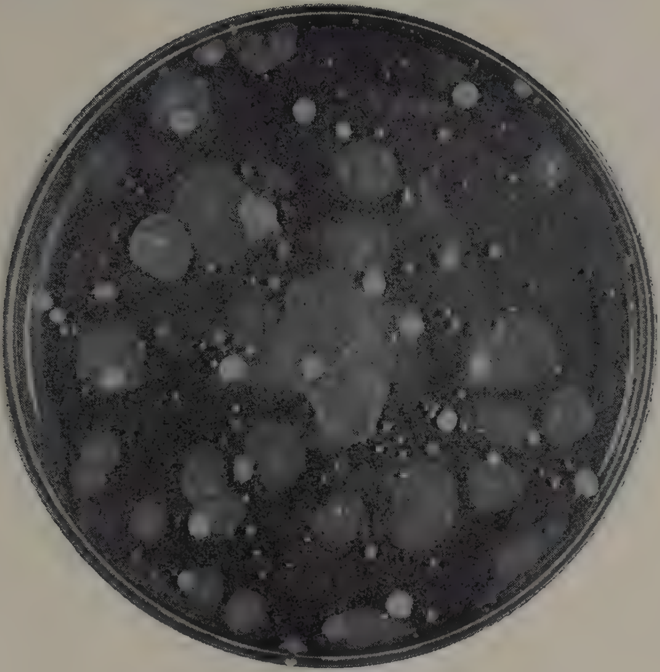


Plate 92.
Before Sterilisation of Milking Machine.—Milk from releaser, showing extensive bacterial infection of quality-affecting types.

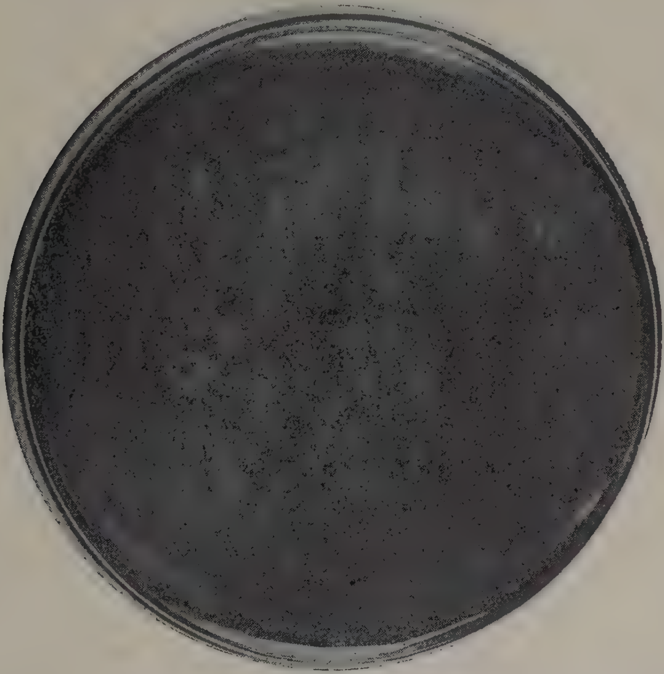


Plate 93.
After Sterilisation of Milking Machine (Wet Steam 2 Minutes).—Milk from releaser.

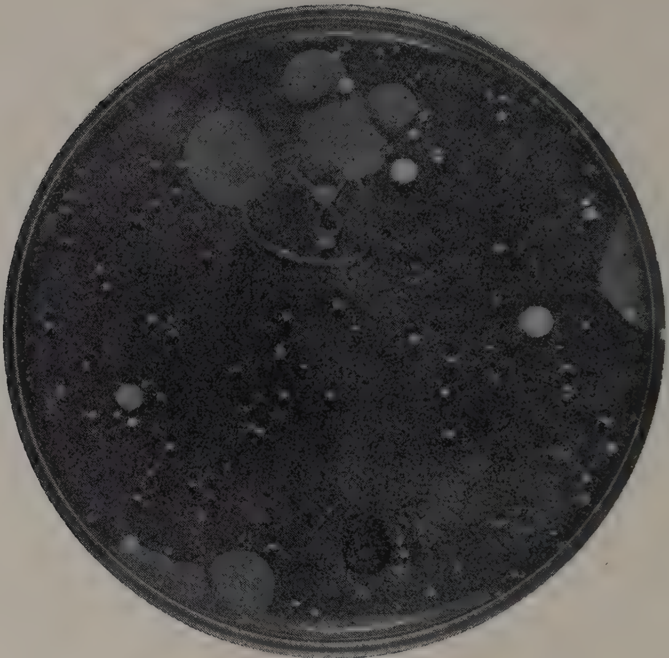


Plate 94.
BEFORE STERILISATION.—Cream from Separator.

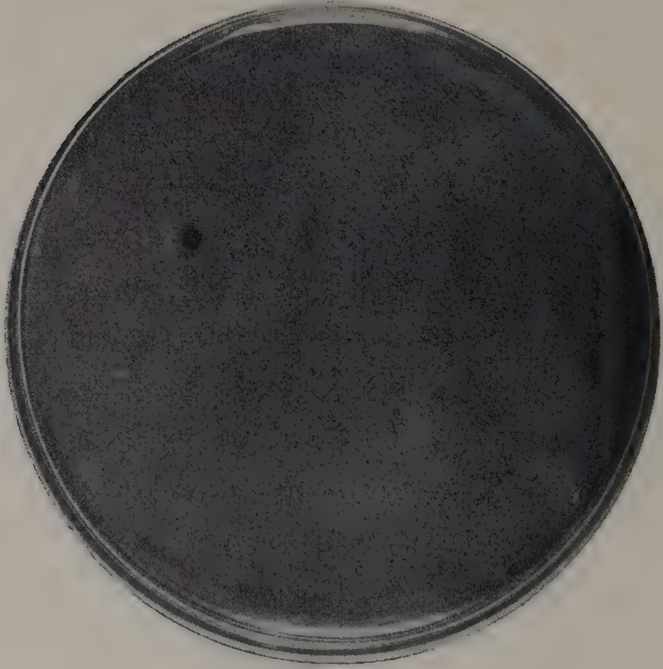


Plate 95.
AFTER STERILISATION (Wet Steam 2 Minutes).—Cream from Separator.

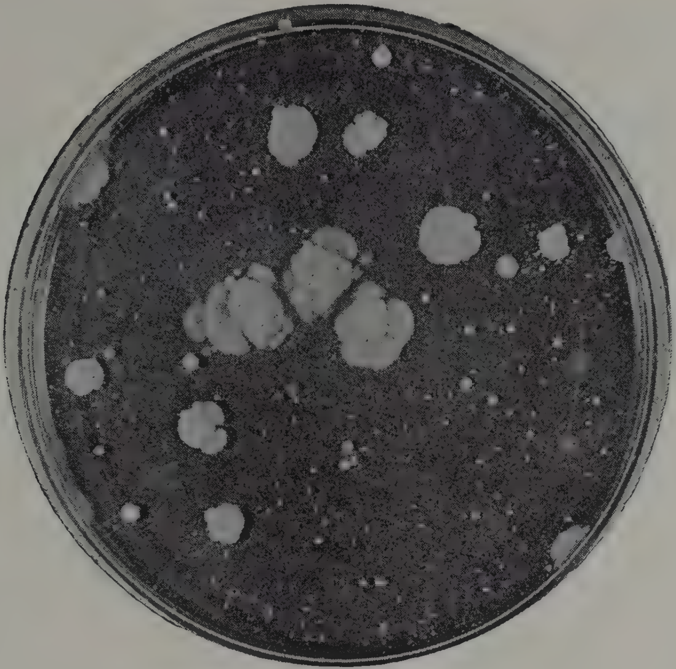


Plate 96.
Before Sterilisation.—Cream from Can.

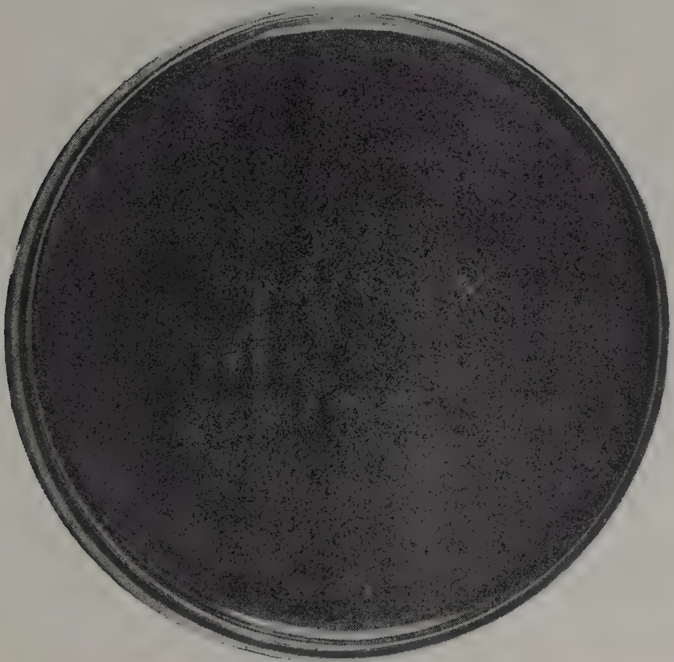


Plate 97.
After Sterilisation (Wet Steam 2 Minutes).—Cream from Can.

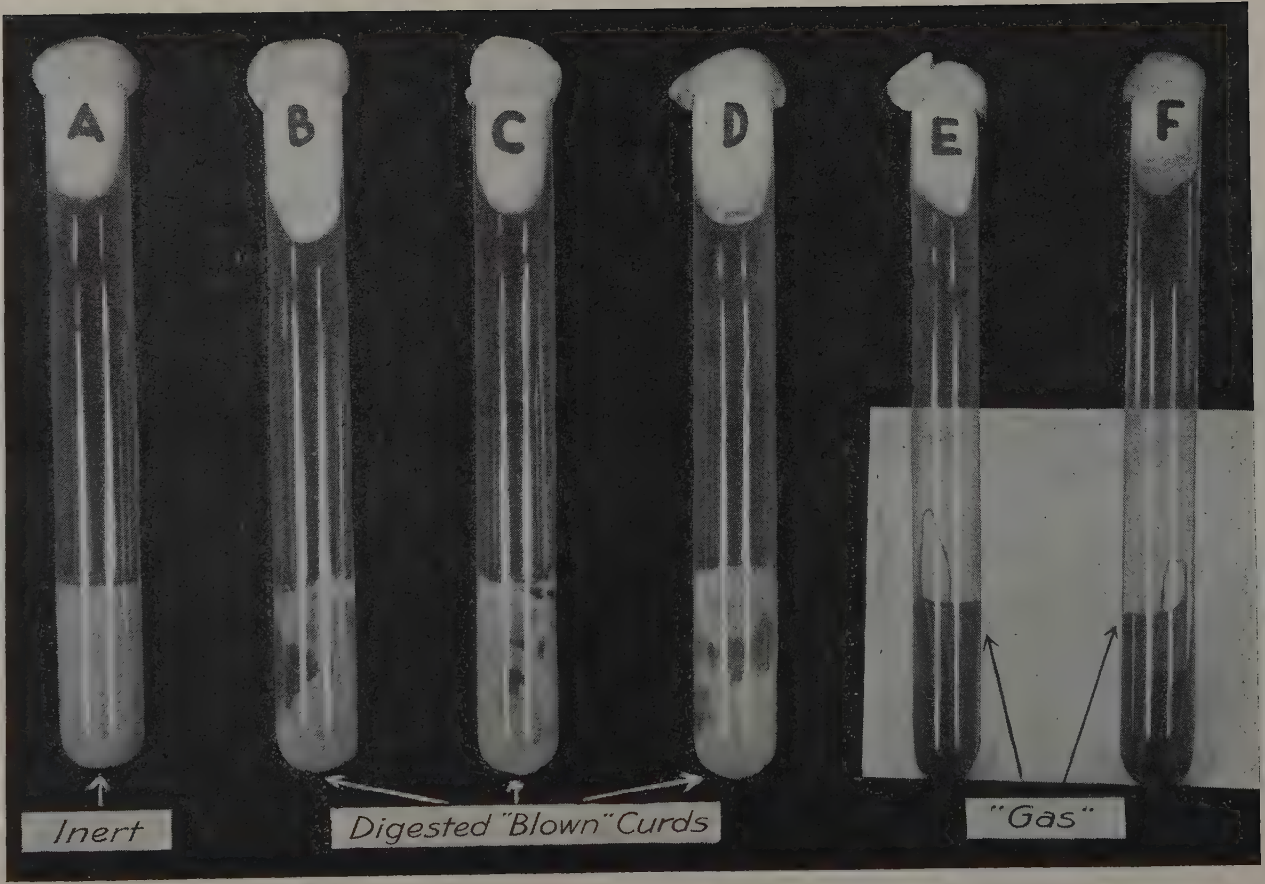

A
B
C
D
E
F
Inert
Digested "Blown" Curds
"Gas"

Plate 98.

Before Sterilisation.—Effect of injurious bacteria on milk. (Note the condition of the curd).

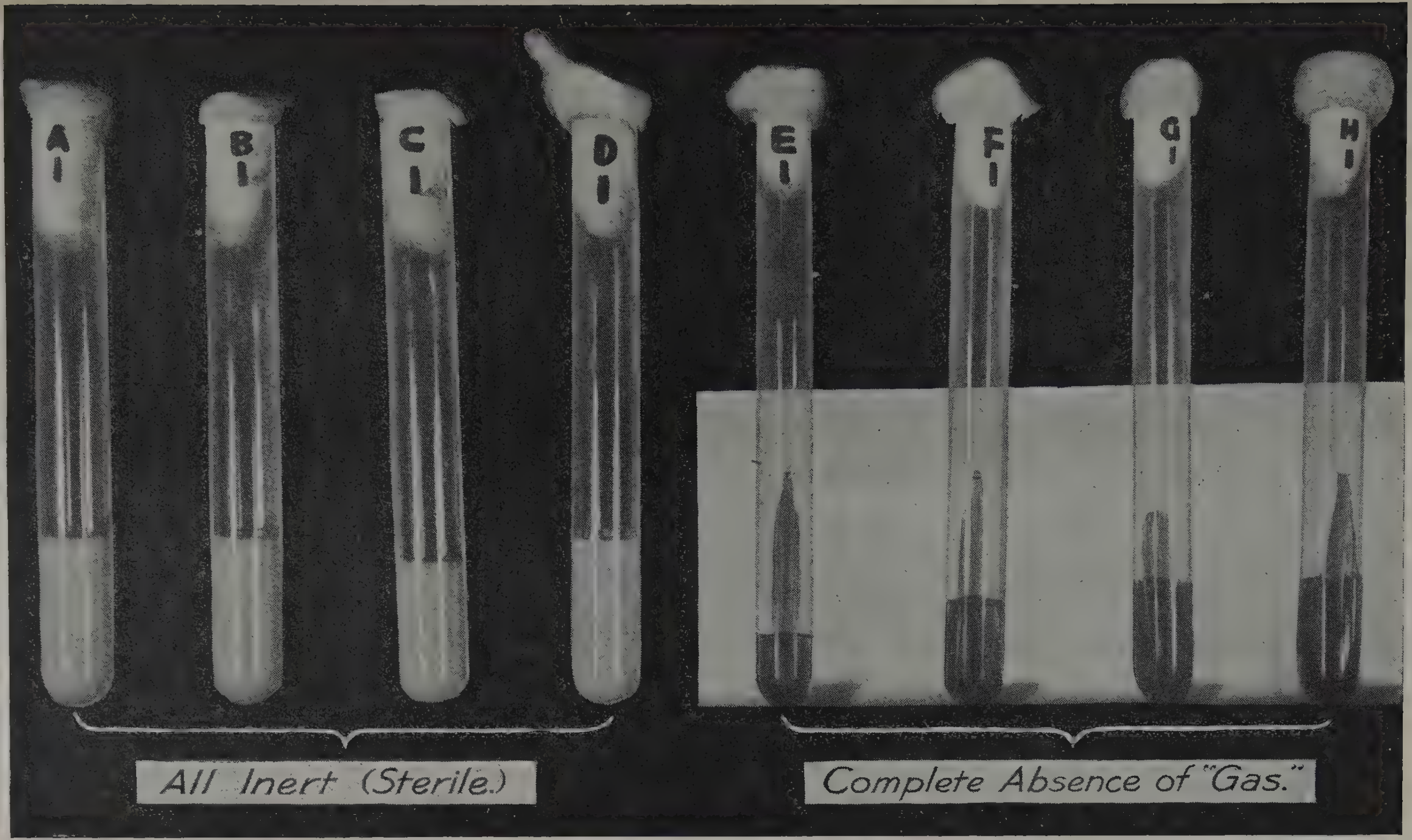

A 1
B 1
C 1
D 1
E 1
F 1
G 1
H 1
All Inert (Sterile.)
Complete Absence of "Gas."

Plate 99.

After Sterilisation (Wet Steam 2 Minutes).—Note the clean, firm curd and compare with Plate 98.

Take, as an example, general dairy hygiene and sanitation procedures. If these are neglected, irrespective of how effective cleansing and sterilising may be, a recontamination of previously sterilised equipment occurs as a result of environmental contamination, dust infections, slime gas coli-aerogenes infections, and other proven sources of pollution revealed in the plate exposure photographs. To combat these proven sources of contamination, apart from the recommended clean yards and bails, liming and limewashing, sterile rinses of all milking machines, buckets, cans, vats, &c., just prior to milking, has been advised.

Cold sterile water rinses from steriliser facilitate this operation, or failing this a cold chlorine rinse, the remnants of the chlorine solution being used as a careful udder wash before milking. Rejection of the foremilk then completes this first part of the dairy shed hygiene technique. *The importance of udder washing and rejection of foremilk* in both prevention and detection of udder troubles, such as mammitis, is emphasised.

Cleansing Technique.—The fundamental principle to observe in this procedure is that it does not involve complete destruction of quality affecting bacteria, nor should it be used as such. It is purely a chemical or physical process for the satisfactory removal of *milk solids and fats.* In fact, combining high temperatures with these procedures is often disastrous to equipment, milking machine rubbers and inflations, and, in numerous cases examined, baking of casein or milk solids along milk lines and droppers.

Aims of Cleansing—

(*a*) To remove milk solids.

(*b*) To dissolve fats.

(*c*) To remove soda detergents or fat solvents such as washing soda, &c.

Aims of Sterilising.—To effectively maintain a temperature above the thermal death point of most quality-affecting bacteria, in order that equipment may remain *bacteriologically sterile.* Therefore procedure of the cleansing operations shows need for ample cold rinses of dairy equipment, at least 1 gallon to each unit of milking machines, for removal of milk solids, casein, &c.

Procedure No. 2.—Ample detergent hot water rinses (use of washing soda, 1 tablespoonful per 3 gallons hot water or 1 teaspoonful of caustic soda in a similar quantity of hot water). At least 1 gallon per unit *for removal of fats.*

Procedure No. 3.—An ample scalding water rinse alone (at least 1 gallon per unit) for removal of previously used soda detergents.

Procedure No. 4.—Two minutes wet steam sterilisation for destruction of quality-affecting bacteria, with attainment of perfect sterility.

The comparisons illustrated reveal ample justification for adoption and practical application of the new recommended procedures.

Proof of their practical application is that groups of suppliers themselves, acting in conjunction with their hygiene committees, have evolved, organised, approved, and applied this specialised dairy shed hygiene technique, in an effort for uniform milk supply quality improvement.

Extension of Principles—Cheese Quality Improvement.

The factory taken was one showing an average second-grade product with a consistently poor-quality milk supply. (All suppliers except one showing, before the adoption of the improved methods, modified methylene blue reductase tests of less than half an hour and up to one and a-half hours; curds slimy, gassy, and digested, and average bacterial counts up to 20,000,000 per c.c., and cheese consistently second grade).

The first set of results involved summer milk tests, all suppliers using steam sterilisation procedures, but before the application of a uniform co-ordinated specialised dairy hygiene technique.

THE WEATHER CONDITIONS AT THE TIME OF SAMPLING: A WARM NIGHT FOLLOWED BY HEAVY RAIN.

Distinguishing Number of Supplier.	Machine or Hand Milking and Steam Sterilisers.	Sediment Test.	Modified Reductase Test.	
			Nights.	Mornings.
		Morning.	Hours.	Hours.
2	Hand	Clean . .	4½	. .
5	Machine	Clean . .	4½	. .
8	Hand	Clean . .	2½	. .
9	Hand	Clean . .	3	. .
6	Machine	V. clean . .	4½	. .
4	Machine	V. clean . .	½	2½
1	Machine	V. clean . .	2	. .
7	Machine	Clean . .	4½	. .
3	Hand	Clean . .	1½	. .

No.	Fermentation Test. Digestion (D) Gas (g) Smooth, clean, coag. (S)	Wisconsin Curd Test.	Milk Agar Plate Counts Morning's Milk (37°C.—48 hours) Representing Initial Utensil Infection. Aim—50,000 Inert Count per c.c. with absence of Coli 1/100 c.c.	Coli Forms Absence Desired, in 1/100 c.c.
2	S	Firm, smooth, clean . .	1,000	Neg. 1/100 c.c.
5	S	Firm, smooth, clean . .	13,000	Neg. 1/100 c.c.
8	S	Firm, slight gas . .	50,000	Neg. 1/100 c.c.
9	S	Firm, smooth, clean . .	4,000	Neg. 1/100 c.c.
6	S	Firm, smooth, clean . .	1,000	Neg. 1/100 c.c.
4	D and g	Firm, slight gas and unclean	600,000	+ 1/100 c.c.
1	S	Firm, gas, unclean . .	100,000	Neg. 1/100 c.c.
7	S	Firm, smooth, and clean	20,000	Neg. 1/100 c.c.
3	D and g	Firm but gas and unclean	2,000	+ 1/100 c.c.

No.	Litmus Milk Inoculation.	Direct Microscopic Observations (Night's Milk).	Reason.	Grade Consideration of all Tests for First Grade Standard.
2	Clean acid fermentation	Bacterial and leucocyte count good	. .	Satisfactory
5	Clean acid fermentation	Bacterial and leucocyte count good	. .	Satisfactory
8	Acid, slight gas . .	Bacterial count fair ; leucocyte count good	. .	Satisfactory
9	Clean acid fermentation	Bacterial count fair ; leucocyte count good	. .	Satisfactory
6	Clean acid fermentation	Bacterial count good ; leucocyte count good	. .	Satisfactory
4	Acid digestion and gas	Bacterial count very high ; leucocyte count good	Utensil infection	Unsatisfactory
1	Acid, slight gas . .	Bacterial count fair ; leucocyte count good	Utensil infection	Satisfactory
7	Clean, acid fermentation	Bacterial and leucocyte counts good	Utensil infection	Satisfactory
3	Acid, digestion, gas	High bacterial and leucocyte counts	With confirmed mammitis	Unsatisfactory

The results reveal the comparative improvement after the addition of steam sterilisation procedures, but with still need for more uniform results with individual suppliers.

An educational and instructional campaign among the suppliers, combining the dairy shed hygiene technique with steam sterilisation, gave the following final set of results on summer milk tests:—

Distinguishing Number of Supplier.	Modified Reductase Test.		Milk Agar Plate Count in Morning's Milk representing Initial Utensil Contamination Aiming at 50,000 per c.c. Total Count of Inert Types with Absence of Coli.
	Night's Milk.	Morning's Milk.	
	Hours.	Hours.	
1	3	Over 6½	2,000
2	4	Over 6½	1,000
3	Over 6½	Over 6½	6,000
4	3	Over 6½	120,000
5	Over 6½	Over 6½	13,000
6	6	Over 6½	1,000
7	4½	Over 6½	20,000
8	5	Over 6½	5,000
9	6½	Over 6½	7,000

Most of the bacteria now occurring were chiefly desirable lactics. At the corresponding period last year, and prior to addition of steam sterilisation and dairy hygiene procedures this year, all except supplier No. 2 revealed modified reductase periods varying from one-half to one and a-half hours as well as dominance of bacteria detrimental to cheese quality, and this at a time when cooler climatic conditions prevailed.

The five machine-milking suppliers previously the worst are now included among the best. All of the suppliers are now producing satisfactory milk quality and, furthermore, the improvement has been maintained over a twelve months' period.

The marked improvement in the quality of the supply is reiterated, and the importance of the improved methods by both suppliers and factory in the production of the best quality cheese is stressed, and the enthusiasm of the suppliers and factory manager in their attempts to attain ideal bacteriological standards commended. This personal element and reliance on the individual for successful application of any new technique is, it is repeated, of first importance.

Cheese Quality.

Cheese manufactured from the pure-quality milk supply mentioned was held over a period of three months to judge the "type of maturation" of this so-called "clean milk" cheese. The milk supply quality was such as to make neither addition of hydrochloric or calcium chloride necessary during treatment, despite pasteurisation at 155 and 158 deg. F.

In the cheese maturity tests held from 15th November, 1938, to 2nd March, 1939, four loaf cheeses were held at 70 deg. F. On final grading all experimental batches of "choicest" grade standard were awarded 93 points. A progressive improvement from 88 points previously to excellent maturation, good flavour, body, and texture was recorded.

Furthermore, periodic tests have revealed maintenance of milk quality improvement since these original tests were applied. Also maintenance of cheese quality improvement was reflected in the many show successes of this factory over the last twelve months.

Following the extension of the principles from individuals to groups of individuals and a cheese factory, the satisfactory results obtained merited extension to a group of cheese factories. Here, again, similar results were obtained, giving generally a more uniform quality milk supply and a more uniform quality cheese.

The results of this group are reflected in the many show successes and continous grading results obtained. Moreover, cheese quality from this group improved to the extent of 51 per cent. choice grade standard with the rest first grade.

The maintenance of quality in all cases has been the most gratifying feature of the original tests applied, and surely sufficient economic justification and incentive for a general adoption of the fundamental principles involved by the whole of the cheese industry in this State, especially in view of the British price differentiation of pay on a quality basis.

Following are details of all tests applied by dairy research officers of the Department of Agriculture and Stock, covering all cheese factories and suppliers of the State over a period of two years testing, including two winter and two summer periods. The standards observed for suitable quality cheese manufacture, computed on the modified methylene blue reductase test, were:—

Class 1—Good milk, not decolorised in five hours.

Class 2—Milk of fair average quality, classed as satisfactory, decolorised in less than five hours, but not less than two hours.

Class 3—Unsatisfactory milk decolorised in less than two hours, but not less than thirty minutes.

Class 4—Very unsatisfactory milk, decolorised in thirty minutes or less.

For cheese industry purposes of classification, two hours and more is satisfactory; below two hours, unsatisfactory.

On these two divisions are based the accumulated summarised information of Tables 1, 2, and 3 and 4, covering comparisons of—

(*a*) Hand *versus* machine milking.
(*b*) Machine milking results with steam sterilisation.
(*c*) Machine milking results without steam sterilisation.
(*d*) Combined results.

Machine milking *versus* hand milking, covering 20 factories involving 559 suppliers tests and 245 suppliers, covering chiefly summer milk tests, and producing at the time of testing dominantly second grade (some thirds and some rejected), was studied.

TABLE 1.

NUMBER OF SUPPLIERS—245, 20 FACTORIES.

Number of Tests.	Under 30 Minutes.			30 Minutes to 2 Hours.			2 Hours to 5 Hours.			Over 5 Hours.		
	Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.
559 ..	123	117	15	73	75	10	48	47	21	16	9	5
100% ..	22 %	20·8 %	2·7 %	13·1 %	13·4 %	17·9 %	8·6 %	8·4 %	3·8 %	2·9 %	1·6 %	·8 %

Table 2 is showing a comparison of hand-milking tests with machine-milking tests, covering all suppliers of the State's cheese industry over a period of two years in three separate groups, and steam steriliser tests over a six months' period since the inception of compulsory steam sterilisation.

TABLE 2.

MODIFIED METHYLENE BLUE REDUCTASE TEST.

Suppliers in Group.	Number of Suppliers Tests.	0 to 2 Hours. Unsatisfactory.			Over 2 Hours. Satisfactory.		
		Hand.	Machine.	Steam Sterilisation.	Hand.	Machine.	Steam Sterilisation.
(1) 653 ..	1,437	401	335	..	464	237	..
(2) 72 ..	814	146	270	78	107	93	120
(3) 245 ..	559	196	192	25	64	56	26
970	2,810	743	797	103	635	386	146

Comparing hand milking with machine milking over a two-year period—

Total hand-milking tests, 1,378—
  Satisfactory: 634, equals 46.9 per cent.
  Unsatisfactory: 743, equals 53.1 per cent.
Total machine-milking tests, 1,183—
  Satisfactory: 386, equals 32.6 per cent.
  Unsatisfactory: 797, equals 67.4 per cent.

The results of the first group of suppliers' tests, including accumulated results to November of last year (prior to steam sterilisation being made compulsory), were:—

Hand-milking tests, 865—
  Satisfactory: 464, equals 53.6 per cent.
  Unsatisfactory: 401, equals 46.4 per cent.
Machine-milking tests, 572—
  Satisfactory: 237, equals 41.4 per cent.
  Unsatisfactory: 335, equals 58.6 per cent.

Comparative results following a three months' instructional campaign since January this year, covering 72 suppliers, and comparison with steam steriliser tests, were:—

Hand-milking tests, 253—
  Satisfactory: 107, equals 42.3 per cent.
  Unsatisfactory: 146, equals 57.7 per cent.
Machine-milking tests (without steam sterilisers), 363—
  Satisfactory: 93, equals 25.6 per cent.
  Unsatisfactory: 270, equals 74·4 per cent.
Machine-milking tests (with steam sterilisers), 198—
  Satisfactory: 120, equals 60.6 per cent.
  Unsatisfactory: 78, equals 39·4 per cent.

Results of tests, principally summer milks, at factories producing at the time of testing dominantly second, some third, and some rejected cheese, covering 245 suppliers, commencing in January of this year, were:—

Hand-milking tests, 260—
  Satisfactory: 64, equals 24.6 per cent.
  Unsatisfactory: 196, equals 75.4 per cent.
Machine-milking tests (without steam sterilisation), 248—
  Satisfactory: 56, equals 22.6 per cent.
  Unsatisfactory: 192, equals 77.4 per cent.
Machine-milking tests (with steam sterilisers), 51—
  Satisfactory: 26, equals 51 per cent.
  Unsatisfactory: 25, equals 49 per cent.

All results since inception of compulsory steam sterilisation requirements last December:—

Total machine tests (with steam sterilisers), 249—
  Satisfactory: 146, equals 58.6 per cent.
  Unsatisfactory: 103, equals 41.4 per cent.
Total machine tests (without steam sterilisers), 611—
  Satisfactory: 149, equals 24.4 per cent.
  Unsatisfactory: 462, equals 75.6 per cent.

The results, therefore, prove conclusively that, under average conditions, machine-milking has produced an inferior quality milk (bacteriologically) than hand-milking.

With the ever-increasing use of milking machines, the dominance of inadequately cleansed and sterilised machines as the cause of defective quality—especially in relation to the incidence of contagious mammitis—it was realised that some cheap yet effective measure had to be adopted.

This is provided for in the recommended steam sterilisation and dairy hygiene technique.

(1) *"Machinitis" or Mammitis and Quality.*—In support of this, apart from the foregoing results, the aspect of mammitis in dairy cattle, as having a very important influence on milk and cheese quality is quoted. The association of the two is too well known to enlarge on further. Two specific cases investigated very recently illustrate further need for its universal adoption.

(*a*) An outbreak of virulent staphylococcal mammitis in which a herd of forty-nine cows was reduced to nine milking cows as a result of the spread of infection through unsterile milking machine teat cup rubbers and inflations. The causal organisms were actually isolated from these points on the requisite blood agar, milk agar, and their distribution confirmed with brown thymol, blue field tests, with further confirmation by direct microscopic observations and bacteriological methods.

(*b*) Another outbreak of streptococcal mammitis examined revealed, approximately, one-third of a herd infected, with increasing spread of the disease. Five had reached a chronic condition and were in the process of losing quarters; others showed all four quarters affected. Spread was attributed to lack of observation and application of a very important fundamental principle of the technique—namely, rejection of the foremilk, so important in the early detection and prevention of spread, with the accompanying specialised hygiene technique.

It also is reiterated that the modified blue test reveals, too, the effect of such udder abnormalities, the leucocytes assisting reduction.

(2) The tabulated results also reveal the influence of the personal element. The three months' campaign reveals the material benefits of steam sterilisation and correct hygiene.

(3) The final results involving milking machines with steam sterilisers and milking machines without steam sterilisers show an appreciable increase in the satisfactory compared with the unsatisfactory percentages.

(4) Aims of the extension work on an educational basis have been to let the new procedures prove themselves, even if there is only one in each factory district.

(5) Finally, that the standards of classification chosen in the tabulated results facilitate the application of grading of milk supplies on a quality basis.

Grading of the Supply.

In support of grading there is the penalising effect of the unsatisfactory class degrading the satisfactory groupings. Secondly, the grading system instituted on the given standards, and classification, serve as a guide to the supplier as to whether a greater effort is necessary for suitable quality production. The competitive aspect, as well as the psychological effect, of testing is proving beneficial in many of the factories in which testing and grading on the modified methylene blue reductase test is now a routine procedure.

The grading standards of classification noted in the two groups are sufficiently wide and representative of all tests completed to ensure manufacture of a first-grade product, the limiting factors being the condition and quality of the starter culture used and the system of treatment and manufacture. Furthermore, the standards were fixed at a period during which the direct relationship of milk quality and cheese quality was revealed.

Finally, in support of grading on the classification is the fact that the present British price differentiation of pay on a quality basis facilitates grading and paying the supplier on a similar quality standard.

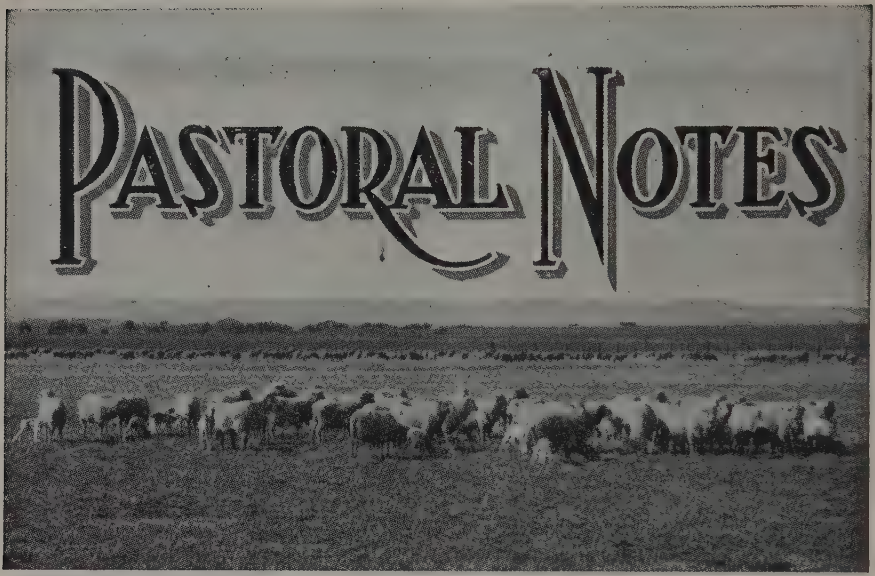
All standards for the satisfactory and unsatisfactory classes were classified on night samples over period of winter milk tests (dated from 1st April to 30th September), and on night and morning samples for summer milk test periods dated 1st October to 31st March.

For all practical purposes, the night milk reveals the limiting factor for cheese quality, and, judged on a two-hour basis for satisfactory quality, gives sufficient play for the elevating or diluting effect of the morning's supply with its germicidal period. The true state of efficiency of steam sterilisation and dairy hygiene procedures practised by suppliers is more forcibly judged on the hygienic condition of the night's milk than that of the morning. At the same time, the classification is sufficiently wide for cheese manufacture of first-grade standard to include the condition or hygienic quality of the treated morning's milk also. The addition of similar cleansing and sterilising procedures after the night's milking must, however, be considered for a suitable hygienic condition in the morning's supply.

With the recent cheese factory improvements in Queensland excellent conditions for quality cheese manufacture have been established.

ACKNOWLEDGMENT.

The assistance of Mr. E. B. Rice, who made available, for use in this paper, the results of 1,437 tests on the milk of 653 suppliers during the period July, 1938–September, 1939, and of Mr. W. J. Park for the results obtained from his examination of 814 samples of milk from 72 suppliers during his investigations in the Mount Tyson district, is acknowledged.



Soda Bush—A Plant Poisonous to Stock.

SODA Bush is a native plant of wide distribution in Western Queensland, northern parts of New South Wales, and parts of South Australia. It is particularly prevalent in the Longreach, Blackall, and Charleville districts.

Soda Bush is an annual with a perennial root stock about 1 to 2 ft. high. The leaves are placed alternately on the stems and are fleshy and nearly cylindrical. The flowers are small and are found in the forks of the leaves. It belongs to the saltbush family of plants.

Although widely distributed in the sheep districts and has no doubt caused heavy mortalities in past years, it never came under suspicion as a poisonous plant until quite recently when losses occurred in travelling sheep in the Ilfracombe district. Since then, other losses have occurred in the Longreach and Blackall districts.

Ordinarily, the plant is, apparently, not very palatable to sheep, and they rarely touch it. When, however, sheep are untrucked after a long train journey and are very hungry, they will eat the plant quite readily. Similarly, sheep which have been travelling over a bare stock route for two to three days will eat the plant when brought on to it. These facts have been noted by competent observers. The important feature, therefore, of Soda Bush poisoning is that there is always a previous history of semi-starvation to be followed by grazing in an area where the plant is abundant.

Symptoms Noted.—Frequently the animals are not seen sick and are found dead in the ''break'' in the morning. When seen, however, they appear dull and listless and often disinclined to move. When forced to move, they may rush forward for several yards and then fall. This may happen repeatedly. When an animal becomes too ill to stand up, it lies flat on its chest with its head stretched out on the ground in an attitude of sleep. This is one of the peculiar attitudes adopted, and appears to be characteristic of this particular condition. There may be some return of the fluid contents of the stomach to the mouth and throat, and this runs away through the nose or the corners of the mouth. Sometimes this material passes down the windpipe and causes pneumonia.

Sometimes poisoning may become chronic in character, and the animal is sick for several days. This is probably due to the ingestion of smaller quantities of the plant. The animal is dull and listless, and the breathing is increased. It is tucked up, and diarrhœa may be present. Such animals, if forced to travel, gradually become weaker and death follows.

Post-mortem.—There is sometimes a pneumonic condition of the lungs, and there may also be an inflammation of the fourth stomach and small intestines. Fluid may be present in considerable amount in the chest cavity.

Experimental Feeding.—Quantities of the plant, consisting of both old and young growths, were gathered at different times during the 1938-39 summer and sent to the Animal Health Station, Yeerongpilly, for experimental feeding. As a result, it was shown that sheep could be poisoned quite easily by feeding the ground-up plant, or by soaking the plant in water and then drenching the animals with the fluid obtained. Amounts as small as one pound killed some sheep, while others took amounts up to 5 lb. Probably the susceptibility of sheep varies, or, perhaps, the toxic agent may vary in amount in different plants.

General Remarks.—Since sheep losses are nearly always associated with a history of previous starvation, it is imperative that care be taken to keep hungry sheep off places where the plant is growing in profusion. If untrucked after long journeys, they should, if possible, be given a feed of lucerne if the Soda Bush is growing abundantly along the route which the sheep are to immediately travel, and particularly if other edible plants have been eaten out. It is, of course, a common feature of stock routes to find that all the usual edible grasses have been eaten out for miles from some of the western trucking areas, and very little but Soda Bush has been left growing. Once the animals have had a feed, even if only a small one, they are not likely to break away when first liberated from the yards.

◆

SHEEP ON THE FARM.

Sheep should have a permanent place on any farm on which conditions are suitable. One of the advantages of sheep is that they provide two distinct sources of income annually—wool and mutton—besides their natural increase.

In Queensland, merino sheep constitute about 97 per cent. of our total number. This breed is especially adapted to conditions in the Central and Western districts of the State, but when forced to breed and develop in an unsuitable environment, constitutional weakness is a real risk.

British breeds have been developed and maintained under conditions where environment has influenced adaptability to Queensland conditions. In mixed farming districts these breeds—especially the pure-bred rams—can be used with advantage. The Corriedale originated in New Zealand, and the improvement of the breed has been progressive both there and in Australia. In Queensland, the Corriedale is regarded as a dual-purpose sheep coming between the merino and pure British breeds, overlapping both in adaptability to a considerable degree.

In sheep-breeding, local conditions should decide the system of production.

Sheep-breeding under diversified farming conditions where the British breeds are used is entirely different from merino breeding in the West. The merino is bred under purely pastoral conditions, and the progeny is retained for wool and mutton production. With the imported mutton breeds, the aim of the farmer is to dispose of the progeny at the earliest marketable age. To do this successfully, two major points should be observed:—

(1) The use of pure-bred rams of quick-maturing qualities suitable to location and conditions.

(2) Availability of suitable pasture or cultivated crops for ewes as soon as their lambs are dropped, and for topping off the lambs.

Other considerations of importance are the suitability of the ewe flock for wool production as well as for breeding; economy in pasturing the ewe flock from the time the lambs are taken off until the next drop of lambs; the general health of the flock and freedom from parasites, fodder provision for carrying the flock successfully through periods of scarcity; and culling the breeding flock for age while they are still capable of being fattened and sold at a profit. To start successfully in breeding, whether for wool, mutton, or for fat lambs, healthy sheep are essential. This may mean paying more for young sheep, but it will generally prove the best and safest policy.

THE DARLING PEA PEST.

When the Darling pea is in pod, its effects on animals are most noticeable. There is no medicinal treatment, but sheep noticed as affected should be removed immediately to a paddock in which the plant is not growing. Recovery is then certain and rapid, unless, of course, the animals are too far gone.

If practicable, the plants should be hoed out and destroyed. If very thick a flame thrower may be profitable to use.

One thing is certain, however, once sheep have acquired a taste for Darling pea, they will always look for it—hence the necessity of grazing these particular sheep on country where the plant does not exist.

VARIETY IN STOCK-FEEDING.

The flesh forming materials in foods (proteins) are composed of units termed amino acids. These amino acids are synthesised by plants, but it is very doubtful whether they can be ''manufactured'' by vertebrates.

The most useful proteins are those which contain the greatest variety of amino acids. For this reason, animal by-products—milk, eggs, flesh, &c.—stand alone. If a vegetarian diet is to be persisted with, it must be selected from a wide range of foods so that the missing amino acids in one material way may be made up from another. This explains the benefits of variety in live stock feeding.

HORSE BOTFLIES.

As warmer weather approaches, horses may become greatly troubled by botflies. These flies are bee-like in appearance and possess two wings and a slender pointed abdomen. When laying eggs, the female fly hovers around the horse with the abdomen curved beneath the body. This has given the erroneous impression that the botfly stings, but its abdomen is held in this position merely to facilitate the deposition of its eggs. The eggs are laid on the hairs of the chest, throat, mane, shoulders and legs of the horse, but more frequently on the hairs of the throat and the inside of the forelegs.

In time, the larvæ develop within the eggs and hatching occurs when the horse licks or rubs the spot on which the eggs are present. In some way or other the hatched larvæ reach the mouth of the horse and then burrow into the flesh of the tongue and cheeks. Here they remain for a little while, but eventually make their way into the stomach. When fully grown they are passed out of the animal with the dung, burrow into the ground and pupate. In the pupæ the adult botflies are formed and they emerge after a period of a few weeks.

Botflies are harmful to horses in two ways. Firstly, the horse instinctively recognises them as enemies and makes desperate efforts to prevent the female botflies approaching and laying eggs. During the botfly season, horses thus become very difficult to manage in harness, and may also hurt themselves in their attempts to avoid the flies. Secondly, the bots in the stomach may cause serious trouble. Each bot has a pair of stout hooks in its mouth, and also rows of hooks around its body. These hooks irritate the lining of the animal's stomach, and may cause ulcers and other ill-effects.

Various methods have been devised to prevent the botflies from approaching horses and laying eggs. One of the simplest and most successful is a piece of canvas attached to the horse's noseband and headstall so that it covers the throat completely. Deep sheds or brush shelters also will give protection, as the botflies will not follow the horse out of the sunlight.

For the removal of the bots from the horses's stomach, carbon bisulphide is advised. This is given in a capsule after twenty-four hours starvation at the rate of 6 cubic centimetres—about one ordinary teaspoonful—for every 250 lb. weight. The best time to treat a horse for bots is about May or June, for at this time of the year all eggs on the body will have hatched and, as no flies are about, the horse cannot become reinfested immediately after treatment.

OVERSTOCKING A WRONG POLICY.

Stocking capacity is a point in the management of pastoral lands which is often neglected. It should be accepted as a truth that two well-fed sheep will give a greater monetary return than three half-fed animals and more than four half-starved sheep. The return from properly nourished sheep would be probably even higher were their greater resistance to internal parasites taken into consideration. Some of the evils of overstocking—altogether apart from total losses—are loss in wool per head, as the result of unthrifty growth; a possible break in the staple; poor lambings; a distinct loss on those animals which should be turned off as fats; and last, but not least, the erosion of country, of which overstocking is an important cause.

From the point of view of returns alone, it will be found that over a period of years a property stocked well within its carrying capacity will average far better returns than one where overstocking is the policy of the management.

Some graziers put forward the argument that, taking lean years into consideration, they have to stock to over-capacity to make ends meet. This policy is however, considered to be wrong, especially when returns are averaged over a number of years.

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CARE OF THE FAT LAMB EWE FLOCK.

Some farmers have the prospective mothers of the fat lamb drop too fat for the purpose. This is wrong in two ways, Firstly, with too much condition a light lambing is likely; and, secondly, feeding the ewes at mating time on grown crops is wasteful and unnecessary.

The ewes should be in strong store condition. It is advantageous to ''flush'' the ewes on green feed a fortnight before mating. No feed is too good for the flock when the lambs are dropped.

Beware of jetting with an arsenical preparation before joining. This results very often in a poor lambing. If jetting is necessary, the job should be done six or seven weeks before the rams are joined.

Crutching the ewes a month before lambing is advisable.

Careful watch should be maintained for internal parasites, and systematic drenching undertaken so as to free the ewes of the pest long before the lambing season.

Avoid unnecessary yarding with the in-lamb ewes.

Provide a lick suitable to compensate for known deficiencies in the pastures.

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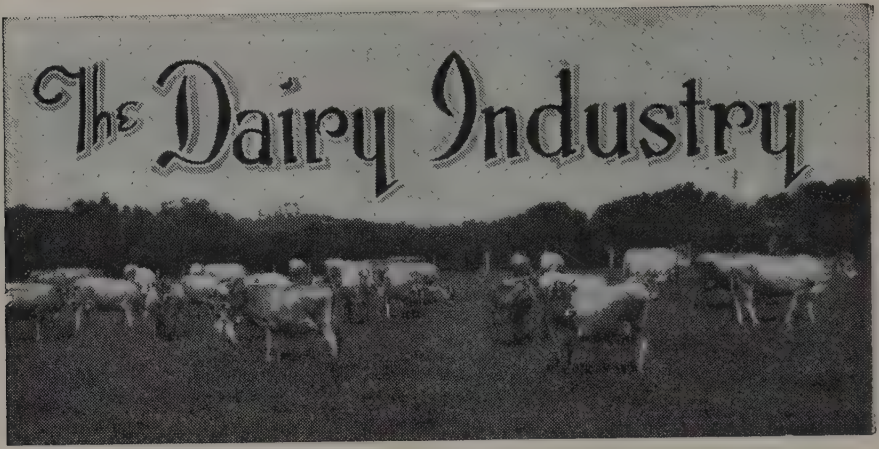
THE CORRIEDALE AS A FARMER'S SHEEP.

As an all round general utility farmer's sheep nothing beats the Corriedale. There is no better ewe for the production of fat lambs. Joined with one of the Downs rams—such as the Dorset Horn or the Southdown—the lambs they produce are first class.

Corriedale ewes are docile, good doers, and great milkers.

In Queensland there is a tendency to breed the Corriedale too fine, thus defeating the object for which the breed was evolved.

No finer wool than a 56 counts should be tolerated in the Corriedale stud. To get the fleece as fine as merino counts can only be done at the expense of constitution, one of the Corriedale's most important characteristics. Growers of pure bred Corriedale sheep would be well advised to cull rigorously any animal showing too fine a tendency.



Dairy Management.

TEMPERATURES on the average farm sometimes present a difficult problem, but good dairy management depends largely on their regulation and control. The removal of animal heat from milk and cream as soon as possible after milking or separating, followed by storage in cool surroundings, will greatly lengthen their useful life by delaying the growth and development of bacteria. Together with straining, which serves to remove the visible dirt and so reduce the numbers of micro-organisms, control of temperature forms a method whereby the farmer can definitely increase the value of his product.

Straining.—Cow hairs, flies, dust, and dung particles and other foreign matter carry with them enormous numbers of bacteria, and should be kept out of milk by every possible means, for no amount of straining can remove bacteria once they have become free in the milk. Should some visible dirt gain entrance, however, the straining of each cow's milk through a cotton-wool disc immediately after milking will minimise the damage caused.

Straining should be done once only, and should take place before cooling or separating. The disc type strainer prescribed by the Dairy Regulations is preferable to any other, since each disc is discarded after use; provided that the metal parts are scrubbed and sterilized, there is no risk of recontaminating the milk as with a cloth which has not received thorough washing and boiling; also, the finer mesh of the wad will trap smaller particles than will a cloth. If a large quantity of sediment is being removed, the disc should be changed during milking.

Cooling.—Some form of cooling is necessary to counteract rapid bacterial development; and the most usual medium for the purpose is water. Adequate water is necessary for cooling, and if the supply is insufficiently cold an evaporating device or the use of ice may be required to bring the temperature of the cooled milk to 60 deg. F. or lower, and cream to 70 deg. F. or lower. If deep well water is available the maximum advantage in temperature can be obtained by pumping it direct to the cooler or trough when required. In the case of shallow well, surface, or tank water, some means of storing it, protected from the heat of the sun, must be devised if it is to be useful as a cooling agent.

An insulated tank, through which cold water flows and in which cream cans may be placed, is a fairly satisfactory arrangement for reducing the temperature steadily with constant stirring, which also aerates the cream; the water is then run to a trough for watering stock.

For cooling and aerating milk, the best type of cooler is the endless corrugated type, which can be used in conjunction with a water-bag evaporator (filled after each cooling in preparation for the next), or with a fixed tank to which water is pumped and flows through the cooler by gravity, or with a refrigerating unit using brine. Such a cooler, having wide corrugations and no end plates, can be easily cleaned with a brush and has no awkward crevices. Porous cylindrical containers, large enough to hold a single can, working on the evaporation principle, are being used in some districts successfully, and have the advantage of being transportable and economical of water.

Refrigerating is a sure and certain way of improving quality, for, although it actually does not kill harmful bacteria, it renders them dormant and unable to cause deterioration of milk or cream. Many farmers are coming to the conclusion that the improvement in grade resulting from refrigerating their product on the farm makes it financially economical. Very little bacterial growth takes place below 45 deg. F., but the growth rate of the common milk types increases steadily above this, up to around 100 deg. F., and is, of course, favoured by summer conditions. During sultry weather, especially, extra care and precautions need to be taken with regard to cooling and cool storage of milk and cream.

Storage.—The Dairy Regulations provide for a suitable storage room (Dairy House A) for milk and cream, or for milk only a well-covered ventilated stand will suffice. A clean wet bag wrapped around a can will assist cool storage by insulation and by evaporation. Direct summer sunshine in Queensland has tremendous heating power, and the proper protection of cream left adjacent to the road awaiting the carrier is, therefore, also important. Thick timber roofing over the cream stands affords greater protection than galvanised iron, which is not permitted under the Dairy Regulations.

Careful temperature control right from the start is the key to safeguarding quality in either milk or cream production, for whatever purpose they may be required.

MANAGING THE BULL.

The bull should be kept away from the rest of the herd in a separate run securely fenced and provided with water and shelter. A small service yard and a crush to facilitate the handling of the bull when necessary should also be provided.

The advantages gained by keeping the bull away from the herd are:—

1. Calving can be regulated.
2. It is easier to decide whether or not the cow is in calf.
3. The bull's services are controlled and not wasted.
4. There is less likelihood of the cows having to return to the bull.

If the run is placed well away from a public road, any annoyance caused by a neighbour's cows breaking into the bull or the bull breaking out is avoided.

STEAM STERILIZATION OF DAIRY UTENSILS.

Research in most countries of the world has demonstrated that the most prolific source of contamination of milk and cream is the utensils with which they come into contact, many of the investigations having shown that 90 per cent. of the original contamination arises in this way.

Many hundreds of tests carried out recently in this State have revealed that under sub-tropical dairying conditions and also because of the extensive use of the milking machine—which is most difficult to maintain in a sanitary condition—utensils are of even greater import than in countries with a more temperate climate and where mechanical milking is not so common. Because of this special problem, steam sterilization on all farms operating milking machines is now compulsory under the Dairy Produce Acts. A recent investigation on the Darling Downs showed that milk produced on farms operating milking machines was decidedly inferior to that produced on farms on which only hand milking is practised. It may be confidently stated, however, that if sterilizing equipment were installed and used properly on the farms using milking machines, the milk produced would surpass in bacteriological standard that produced on the hand milking farms, for undoubtedly milk of the highest bacteriological quality can be obtained when milking machines are operated according to an approved hygienic technique, embracing steam sterilization.

The Department, by insisting on any sterilizer intended for dairy purposes being officially tested and approved before being marketed, is protecting the farmer, who now has a choice of a number of small sterilizers suitable for dairy purposes. The additional cost of the sterilizer should not be considered a bar to its purchase by anyone who can afford to equip his farm with a milking machine, for, in fact, it is a necessary adjunct. Moreover, the cost will, in many cases, soon be recouped because of a consequent improvement in cream grading.

It is sometimes suggested that "scalding" is as effective as steam sterilization. Certainly, the small dairyman may achieve consistently good results by the use of boiling water only for sterilizing, but "scalding" temperatures have been found in recent field investigations to vary from 130 deg. F. (little better than luke warm) to really boiling water, provided by a special semi-cylindrical boiler in which the cans may be completely immersed. Under every-day farm conditions, however, "scalding"—that is, pouring hot water from vessel to vessel—even in the hands of a careful supplier is not an effective substitute for steam. For sterilization to be effective, utensils should be completely immersed in boiling water—an almost impossible requirement for milking machine parts.

It is emphasised, however, that although steam sterilization only cannot be expected to solve all the problems associated with the production of a choice quality cream, it will almost certainly be successful if coupled with methods calculated to minimise the contamination from other sources besides the utensils. In this connection the salient points which should receive attention are:—

(1) Keeping buildings and equipment clean and free from dust.
(2) Rejection of foremilk.
(3) Washing of udders and milkers' hands.

(4) Thorough cleansing, immediately after milking, of all utensils in the approved way and washing of milking machines according to recommended procedures. (Sterilization is only complementary to thorough washing.)

(5) Storage of washed and sterilized utensils away from a contaminated atmosphere.

(6) Keeping milk or cream as cool as possible and away from dusty yards.

Finally, the economic aspect of steam sterilization is of particular importance. By ensuring the supply of choice quality cream—the producer gets paid for that grade, as provided for in the Dairy Regulations—a material contribution is made towards the raising of the quality of Queensland's butter output.

A CATTLE CRUSH ON EVERY FARM.

A crush for holding cattle or horses should be built on every farm. It costs little and occupies a small area; yet it saves much time and labour when full-grown stock are to be dehorned, branded, castrated, speyed, drenched, or otherwise treated. For these operations, the animal should be held in a position which allows of no movement.

The ordinary crush can be arranged to accommodate large or small animals. A series of auger holes ($\frac{1}{2}$ inch diameter) are bored about 6 inches apart along two rails of convenient height on each side of the crush. The holes should be deep enough to seat a bolt or iron pin firmly. The bolt or pin should stand 4 to 6 inches above the rail. These pins—one on each side—serve as chocks against which a cross rail may be placed. By working the animal right to the front of the crush, the pins and rails may be arranged to prevent any "backing." In a similar way the width of the crush may be adjusted to prevent lateral movement.

To secure the head of the animal, the "A" shaped bail-type of structure may be made from a double cross rail between which slide vertical poles attached to the base of the crush posts by stout hinges. With such a crush, many farm operations usually requiring four men can be done quickly and efficiently by a man and boy.

A HORN-TIPPING TIP.

Much time and energy is often wasted in the practice of tipping the horns of cattle. Some owners of stock are slipshod in their methods of removing the points of horns. In doing the job, care should be taken to ensure that the cut does not slant. Oblique or slanting saw cuts defeat the object of the operation, for, although the tips are removed, sharp, chisel-like edges remain on the horns, leaving an animal still capable of inflicting a nasty injury to another. Even when cut squarely across, tipped horns remain capable of causing severe bruises. Horns with chisel-shaped points are a menace to all other animals within reach of their possessor, and consequently a probable cause of reduced profit to the stockowner.

RIGHT METHODS IN DAIRY PRACTICE.

Some dairy farmers—especially some who have only recently established dairy herds—are often unaware of the essential points for the satisfactory and cleanly production of milk and cream.

The bacteria responsible for the spoilage of milk and cream are to be found in large numbers on the farm, and if careful methods are not used they may enter from any or all of the following sources:—

(*a*) The udder, if the animal is not absolutely healthy, and if fore-milk is not discarded.

(*b*) The cow's coat and skin, if not groomed before milking.

(*c*) Dust in the cowbail or dairy.

(*d*) The milker's hands, cloths, or person.

(*e*) Milk buckets and equipment imperfectly cleaned, or not sterilized.

The health of the cow is, of course, of first importance and the farmer must assure himself that every animal in his herd from which milk is being produced is in fit condition and free from any signs of disease.

Grooming the Cow.—Some preparation of the cow before commencing to milk is necessary in wet weather to remove the mud and dung splashed on the udder and teats, and, under summer or drought conditions, the dried dust, which is equally dangerous to milk quality.

The flanks and tails should be kept free from caked mud and dung by the occasional use of a currycomb, and the dust removed as often as necessary by grooming with a stiff brush dipped in clean water. It is a common practice on "model" farms to keep the hair on the flanks as well as the udder clipped short to avoid the collection of dust and dirt. Occasional clipping and regular grooming will make the daily routine of keeping the udder clean a very simple task. It is only when cows have been neglected that the washing of udder and flanks takes any great length of time.

The udder and teats should be washed before each milking. This is best done with a cloth (preferably of the woven type) kept for the purpose, and a bucket of clean water, using a separate cloth, with a second lot of clean water, if necessary, for finishing off the udder. A small amount of potassium permanganate (Condy's crystals) or some chlorine compound, added to the water is an extra precaution observed by many farmers, which is advisable if there are any cases of sore teats, or where the water used is of doubtful purity. The teats are left damp, but not dripping, so that any remaining dust or loose hairs will adhere to the surface and not fall into the milk. Uddercloths must be washed out and boiled every day, otherwise they become a dangerous source of bacteria and the object of washing the udder will be defeated. Both cloths and bucket should not be used for any other purpose.

With practice, this routine preparation of the cow for milking can be very quickly and yet thoroughly carried out. It can be done by a boy, and the time spent—one minute or less per cow—is negligible compared with the reduction in the number of bacteria gaining entrance to the milk and cream from this source.

POLLED CATTLE.

In any programme of breeding or of grading up existing herds, the introduction of polled stock should be regarded as a necessity. Shorthorns and Herefords represent the bulk of the beef cattle in Queensland. The polled Shorthorns and Herefords are a comparatively recent development and the percentage of polled stock which will result from crossing with horned breeds is uncertain.

With the so-called ''natural polls,'' the power to transmit this characteristic is marked. It is most noticeable in the Galloway breed, but this type is not largely represented in Australia.

Red polled bulls crossed with horned breeds or their crosses may produce a large percentage of hornless stock, but the prepotency of Aberdeen Angus bulls with respect to colour, conformation, and hornlessness is superior. From 80 to 90 per cent. of the calves obtained when Aberdeen Angus bulls are mated with horned stock of mixed breeding are black in colour and most of them hornless.

VEALER CALVES.

Provided a calf is kept on the mother to allow it to reach a live weight of about 80 lb., a satisfactory return is assured when marketed. Large numbers of calves are being slaughtered annually for export as boneless veal, and the trade has reached such proportions that buyers are usually operating in all dairying districts. It is well worth while to keep the calf for a while before selling for slaughter. A calf responds quickly to a few days' suckling, and this can quite easily mean the difference between an underweight and overweight calf—a matter of at least 5s. in its value.

POINTS OF A DAIRY HEIFER.

In the selection of a dairy heifer, the form and general character will, to a great extent, indicate whether she will develop into a good producer. When a heifer is quite young, the trained eye of the judge can see its dairy value and can discern the dairy type as distinct from the beef type. The production records of her ancestral dams on both sides are important factors in determining her future dairy value, while constitution is also important.

The form of the heifer with a future as a profitable producer is, in miniature, that of a good type, fully-developed dairy cow. Dairy characteristics are indicated by an absence of surplus flesh; she is somewhat angular and spare. The head is typical of her breed, the eyes large and bright, and muzzle large, ears of average size, neck lean and lengthy, sloping with the shoulders. She is sharp over the shoulders, ribs well sprung, with good heart girth. The forequarters are light. Digestive capacity is indicated by the depth through the barrel from the centre of the back to the navel. Good depth indicates ample capacity to convert food into milk. The greater the depth through the middle, the greater the production is likely to be. The back is straight. There is a good length from the hip to the pin bones, and from the hip to the flank. The thighs are flat and free from fleshiness; the line of the thigh is incurving. The bones should be light and not coarse. The tail should be thin and free from flesh. All of these points should indicate that there is no tendency to lay on flesh.

The udder (as yet undeveloped), milk veins, and wells are reliable indications of the heifer's future value as a dairy cow. The skin covering and surrounding the immature udder is soft and loose with teats well placed. The milk veins can be followed with the finger and milk wells gauged. Comparatively well-developed milk veins and large milk wells also are important points in judging a dairy heifer.

VARIATIONS IN CREAM TESTS.

Some dairy farmers wonder why their factory returns show variations in the fat tests of their cream. Actually, variations are bound to occur.

Conditions under which milk is separated lead to changes in cream tests, as shown by the following facts:—

The separator should always be run at the speed directed by the manufacturer. It is better to turn at too high a rate than too low, for in the latter case the fat loss in the skim milk is increased in proportion to the decrease in the number of revolutions.

The milk must be allowed to enter the bowl freely during separation. The level is automatically controlled by the float, and if the flow is partly shut off a higher testing cream will result. An over supply will result in a lower testing cream, and, more important still, excessive fat loss will occur.

Milk is at the best temperature to be separated as it comes from the cow, as it is less viscous than at lower temperatures, so runs easily though the separator, and more perfect separation of the fat results. At lower temperatures, due to the viscosity of the milk, separation becomes more difficult with greater fat losses. It is doubtful whether any machine will do good work if the milk is below 80 degrees Fahrenheit.

The quantity of skim milk or water used to flush the bowl usually varies considerably from day to day, and may cause a variation in the test of 2 to 5 per cent., depending on the quality of cream. Vibration of the separator causes the skim milk and cream to be shaken together, so that they do not find their way to their respective outlets. Fat losses are increased by the escape of fat globules through the skim milk outlet.

Other factors which influence fat losses are the cleansing of the separator and the condition of the milk, but these should not cause any difficulty where there is a proper appreciation of the necessity of hygienic methods.

There is a daily variation in the fat content of the mixed milk from the herd, and this is sometimes appreciable. This affects the test of the cream, but does not influence the quantity. For example, if a herd produced 100 lb. of milk with a fat test of 4 per cent., there would be 4 lb. of butter fat, while, if the fat were 5 per cent., 5 lb. of butter fat would be the result.

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DAIRY CATTLE—PURE-BRED OR GRADES?

The question is often asked: Which is the more profitable—pure-bred or grade dairy cattle? The difference in value of pure-bred and high-grade dairy cattle lies in the higher selling price of the pure-bred. Dairy farms which are so equipped that they can handle the record work effectively will find more profit in pure-bred than in grade cattle. There is a steady market for high-quality, pure-bred cattle at prices which net good returns to the breeder. Whether pure-bred stock will show the best results with any particular dairy farmer depends, however, on his keeping authentic records, and also on his ability as a salesman. Pure-bred cattle which a breeder is unable to sell are no more valuable to him than an equal number of good grades.

A herd of carefully selected grade cows will produce as heavily as the average pure-bred herd, for the reason that they can be culled more closely, as their lower value does not encourage keeping an animal which is not a profitable producer. There is always a good demand for the female offspring at payable prices. Any person going in for dairying for the purpose of producing milk or cream, and not with the idea of gaining a large part of his income from sale of stock, may do quite as well with grades as with pure-breds.

As in most things, success with dairy cattle depends on the individual farmer himself, and whether grade or pure-bred cattle are more desirable can be settled only when the particular conditions surrounding the individual case are considered.

It is sometimes stated that grade cows are better than pure-bred animals. This is not so, but it is true that some grades are better than some pure-bred stock.

One very important fact to remember, however, is that the herd sire should always be a pure-bred. Unfortunately, this is not sufficiently understood by some Queensland dairy farmers, and this accounts to a very large extent for the poor type of dairy cattle one sometimes sees when travelling through the country.

The PIG FARM

Paddocks for Pigs.

FARMERS who have not already adopted the practice are advised to give careful consideration to the advantages of running pigs on the grazing system as compared with the intensive penning system which, until a few years ago, was the recognised practice of most pig keepers.

There is little doubt that the old custom of confining pigs to small pens resulted from the desire to produce very fat carcases. Present-day buyers demand leaner pork and bacon, so it is necessary to alter pig-raising practice accordingly, especially in respect of breeding, feeding, and penning. Provided pigs are bred to the correct type—that is, pigs intended for light porkers bred from quick-maturing stock, and pigs intended for baconers bred from later-maturing stock—they may be kept under grazing conditions from birth until fit for slaughter with very good results. Pigs kept in paddocks throughout their lives have a tendency to grow rather than fatten, and it is the lean, growing pig and not the fat pig which is required for meat.

When grazed, pigs find a lot of their food in the form of pasture or forage crops specially grown in the pig paddocks, and these foods usually require less labour and are cheaper than other pig foods. The pigs not only do their own harvesting, but also return a good amount of manurial matter to the soil, thus maintaining or improving soil fertility.

With the run of a good paddock containing some pasture or green crop, there is very little chance of pigs suffering from mineral or vitamin deficiency. This is a decided advantage over the intensive penning system, in which ill-health often results from a lack of knowledge or care in attempting to supply a complete diet. Penned pigs often suffer from diatetic disorders, and when turned out on pasture recover rapidly.

Under the intensive system, it is necessary to have buildings, floors, and drains well constructed in order to maintain a safe standard of hygiene. This also means extra labour and water for cleansing pens.

There is little, if any, difference in the costs of establishing a good paddock piggery and a good intensive piggery. One of the most important features of a paddock piggery is that the work of tending the pigs is much more congenial, for the only cleaning-up of the piggery consists of cultivating or resting the pig paddock and moving the sheds and troughs, which should be built on skids to allow of easy transport.

Probably the most practical method of controlling worm infestation in pigs is to run them in paddocks which can be cropped, fed off, and ploughed in rotation. This system and the use of moveable equipment is a very satisfactory method of pig raising under Queensland conditions.

RISK OF FEEDING RAW OFFAL TO PIGS.

On many farms a fat beast is killed occasionally for domestic use. Portions of the carcase and viscera are sometimes fed raw to pigs. These form a valuable pig food if cooked; but, if fed raw, the health of animals may be endangered. For example, when an animal is affected with tuberculosis, the primary lesions in the organs, being small, may escape detection. Although the carcase may not be grossly affected, there is a real danger to pigs—especially young ones—if fed with uncooked material from a diseased beast.

Under the Cattle Slaughtering Act, the Diseases in Stock Act, and the Pig Industry Act the feeding of any meat offal or blood to pigs, unless it is thoroughly cooked, is a serious offence.

CORN COB CHARCOAL FOR PIGS.

A good use for the corn cobs (cores) that accumulate on most farms, and around piggeries, is to make charcoal of them. The cores are of little value as a food for pigs because of their coarse, dry fibre content, and even if the whole cob (grain and core) were ground, it is doubtful whether it would be worth the trouble.

After the pigs have chewed all the corn from the cob, the waste cores and husks may be raked toogether into a pile and burned. When the heap is a mass of red hot coals, water may be poured over the pile. The partially charred cores, when cold, may be gathered for the pigs. Bones should also be gathered and burned, and added to the charcoal made from the cores. This cleaning up serves a double purpose; it gets rid of matter that would otherwise accumulate and become a nuisance, and provides charcoal and mineral matter for the pigs.

WHEN SELLING PIGS.

Porkers should be marketed at an age and weight to suit export market conditions, as well as the local trade. Best trade weights, for prime conditioned pigs, range between 60 lb. and 90 lb. dressed (approximately 95 lb. to 139 lb. live weight). For local markets, the best range is 60 lb. to 80 lb. dressed weight (95 lb. to 130 lb. live weight). Porkers should be in good condition, free from bruises, whip marks, or other faults, and be protected from the effects of severe heat; otherwise, they will not dress out to advantage on slaughter. Lighter weights and very thin pigs are not profitable as porkers, and at factories and meatworks will only be paid for at valuation.

Bacon pigs for local markets should be 90 lb. to 130 lb. dressed weight (approximately 140 lb. to 185 lb. live weight) with added range to 160 lb. dressed weight (220 lb. live weight) at slightly lower rate per lb. dressed. For export, the range of weights varies from 120 lb. dressed weight (175 lb. live weight) to 160 lb. dressed weight (220 lb. live weight), but the heavier pigs should not carry too much fat; otherwise, they are subject to reduction in price or to rejection. For local markets also, there is a strict limitation to the percentage of fat, and factories prefer pigs in meaty condition with only a slight covering of fat.

Sows for small goods trade should be in good condition, and should have weaned their litters two months or more before marketing; also, they should not be in pig any more than one month, if in pig at all. Sows close to farrowing and those farrowed recently are liable to condemnation at the factories. Poor brood sows and poor stags are useless and will not be accepted, while boar pigs are useless for meat purposes until castrated, and then well fed for approximately two months, the time depending on the progress made after the operation.

In every instance the greatest care should be taken to avoid bruising and damaging the pigs in transit, especially when loading and unloading. Pigs carted to country sidings for trucking or sale should not be fed immediately before despatch, as such feeding is conducive to heavier shrinkage and to digestive disorders in transit.

It is again emphasised that under the Queensland Pig Industry Act all pigs must be branded by the vendor before sale, barter, or exchange. Full information on any of these points is obtainable from the Department of Agriculture and Stock, Brisbane.

Registered
Hatcheries

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven	White Leghorns
A. F. Buchler, Milman	Pincrow	White Leghorns
J. Cameron, Oxley Central	Cameron's	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled	Rhode Island Reds
B. Cross, Apple Tree Creek, Childers	Spring Hill	White Leghorns, Australorps, and Langshans
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield	Woodville	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
W. Easson, Formosa road, Tingalpa	Grassdale	White Leghorns and Anconas
E. O. F. Eckert, Laidley	Laidley	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner	Australorps
Elks and Sudlow, Beerwah	Woodlands	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Grice, Loch Lomond, via Warwick	Kiama	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
S. W. Kay, Cemetery road, Mackay	Kay's	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale	Nuventure	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore	Stonehenge	Australorps and White Leghorns
W. J. Martin, Pullenvale	Pennington	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels	Australorps
J. A. Miller. Racecourse road, Charters Towers	Hillview	White Leghorns
F. S. Morrison, Kenmore	Dunglass	Australorps, White Leghorns, and Brown Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale	White Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
S. V. Norup, Beaudesert rd., Cooper's Plains	Norups	White Leghorns and Australorps
H. W. and C. E. E. Olsen, Marmor	Squaredeal	White Leghorns, Black Leghorns, Australorps, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central	Pennefathers	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's	Australorps
J. Richards, Atherton	Mount View	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra	Australorps and White Leghorns
W. G. Robertson, Bilson road, Nundah	Ellerslie	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Smith, Beerwah	Endcliffe	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield	White Leghorns
J. Steckelbruck, The Gap, Ashgrove	Cosy Nook	White Leghorns and Australorps
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's	White Leghorns and Australorps
P. and K. Walsh, Cleveland	Pinklands	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview	White Leghorns
G. A. C. Weaver, Atherton	Weaver's	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley	Chillowdeane	White Leghorns, Brown Leghorns, and Australorps
R. H. Young, Box 18, Babinda	Reg. Young's	White Leghorns, Australorps, and Brown Leghorns

BLACK COMB DISEASE IN FOWLS.

Black comb disease in poultry occurs frequently throughout the State from October to March. It usually affects laying hens, and is responsible for heavy losses to the industry either by death or decreased egg production.

Where treatment is prompt the mortality does not appear to be as extensive as when treatment has been delayed. Again, early treatment appears to assist in getting affected birds back into production much more quickly than when it has been deferred.

The first indication of the disorder is a bird's pronounced loss of appetite, followed in the course of a few hours by a darkening of the comb. In fact, it is not uncommon for 25 per cent. of the flock to have a very darkened comb within 24 hours of the first sign of the trouble.

In the early stages of this disease, the temperature of sick birds rises. This induces thirst. As the disease develops, little desire for water is in evidence, and as treatment for this trouble is given by means of the drinking water, the necessity for prompt action is obvious.

On further examination of the sick birds, it will be found in most cases that the crop is full, an indication of the suddenness of the attack. This condition of the crop has caused many breeders to attribute the trouble to the food and water. As the disorder advances the legs, of the Leghorns particularly, become very much darkened in colour; and if the feathers of a bird of any breed are turned back, the skin will be found to be darker than usual. Diarrhœa has been observed in some cases, but it is not apparent in all affected flocks.

The mortality from this disorder appears to be governed largely by the general condition of the flock, and the rapidity with which treatment is applied. Where prompt measures have not been taken, losses have been as high as 20 per cent.; but where early treatment is given deaths have been as low as 1 or 2 per cent. The loss from deaths, however, is not the only important factor. Egg production has been observed to fall from 60 to 5 per cent. within six or seven days.

Treatment.—Several proprietary mixtures are used with apparently beneficial results, but in preference to deferring treatment until these mixtures are procurable, the breeder is recommended to administer Epsom salts to the birds in the drinking water at the rate of 1½ to 2 oz. to the gallon.

SIZE OF EGGS.

Although the internal quality of the egg is of primary importance in determining price, the factor of size cannot be overlooked. Eggs are usually graded for sale according to size, but those averaging 24 oz. to the dozen are in greatest demand, not only in Queensland, but in the markets to which our surplus production is consigned.

In these circumstances, every poultry raiser should strive to produce eggs that meet the requirements of the market. To do this, it is necessary to select breeders that will reproduce progeny capable of laying the maximum number of eggs closely approaching 2 oz. in weight. Most poultry keepers when selecting their breeders know very little about the early performance of their stock in respect of size of egg—particularly the size of egg that a hen laid during her first year of production. As a breed is more prolific during the first laying year, it is then that the egg size is of particular importance.

All pullets when commencing to lay produce an egg very much undersized. Some birds take a considerable time before their eggs reach the most desirable commercial size and others, again, may take only a week or two. As it is an inherited factor, egg size is one of the chief points to be considered in selecting future breeders. Many pullets—the breeding stock of the future—will be coming into production within the next month or so, and it is suggested that poultry breeders who are not entirely satisfied with the size of egg from their flocks should take the opportunity of selecting and marking pullets that commence to lay eggs of a 2 oz. standard early in life. Many of these birds may have to be rejected for some purpose or other, consequently the number selected should be large enough to allow for a reasonable percentage of rejections.

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FEEDING COSTS IN THE FOWL RUN.

Every effort should be made to keep production cost down to a minimum. On many poultry farms this is being done, but on many more feeding costs are too high.

The actual costs of foodstuffs is governed by supply and demand; therefore no material saving can be made at this point. Any change in the present ration fed is of doubtful value, because such a change may result in lowering the egg yield. Again, it is doubtful whether any substitute for the existing rations would be economical. This only leaves the actual practice or management of feeding open to question.

Summed up, the cost of production is governed to a great extent by the food consumed and the wastage. Any reduction in food consumption is followed by a reduction in egg production, therefore feeding costs cannot be reduced by feeding less food.

Food wastage is an appreciable factor in feeding costs. This applies irrespective of the actual cost of foodstuffs, and is applicable to dry mash, wet mash, and grain feeding. By far the greatest wastage occurs with the dry-mash system of feeding. This fact has been pointed out to many farmers, who have immediately remedied the fault.

Faults in the construction of hoppers are the cause of nearly all the wastage that occurs with the dry-mash system. There are many different designs of dry mash hoppers, and a plan of a suitable hopper may be obtained on application to the Department of Agriculture and Stock, William street, Brisbane. This hopper embodies other important features, in addition to that of minimising wastage. The most important thing about any feed hopper is the feeding trough, which should permit ample space for the birds to eat, at the same time preventing any of the mash being wasted.

The hopper referred to embraces these features within certain limits. It also permits the mash to fall freely. It must be understood, however, that some mashes will run or feed more freely than others. Therefore, no one hopper will prevent different grades of mash overfilling the trough and allowing the mash to be readily scratched out. The hopper recommended has a lath along the front of the trough, and in the event of the mash running too freely and permitting wastage this lath can be shifted to reduce the space. This hopper is easily and cheaply constructed.

Recently a poultry farmer installed several of this type of hopper, and although production was maintained at the same level, the hoppers brought about a saving in food costs of approximately £4 a week. Some time ago another farmer installed similar hoppers and reduced feeding costs from five bags to three bags of laying mash each week. These two illustrations should be sufficient to demonstrate that wastage can be prevented. In the latter instance, the farmer was confident that no wastage existed on his farm.

To ascertain if wastage is occuring, a rough estimate may be obtained by looking up the purchases of foodstuffs for the previous month or a longer period. As the birds consume approximately equal quantities of mash and grain, the quantities (by weight) purchased should be approximately the same. In the event of the quantity of ingredients for a mash exceeding the quantity of grain purchased, it indicates that the excess quantity is being wasted.

A more accurate method is to count the number of birds in one shed, then empty the hopper, refill it and record the weight of mash supplied; the period which the mash lasts will indicate the true position, as each bird will consume on an average 2 oz. of mash daily. For example, 100 birds supplied with 100 lb. of mash will consume it in eight days; if it only lasted six days each bird would be wasting 4 oz. weekly; if it lasted seven days there would be a wastage of 2 oz. per bird weekly. Such a small wastage as outlined, of 2 oz. per bird weekly, does not appear to be of great importance, but with a flock of 1,000 birds this would amount to 6,500 lb. in a year and would cost about £35, based on present feeding costs.

Present high costs of all poultry foodstuffs make it essential for every poultry farmer to eliminate wastage. By putting into practice the advice offered wastage will be minimised and the margin of profit increased.

POULTRY POINTS.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the best of foods, yet in spite of that fact the quantity consumed by Queenslanders (estimated on an annual *per capita* basis) is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of dirty-shelled eggs and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times daily, and marketed at least twice weekly in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

MILK AS A FOOD FOR FOWLS.

Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding and, to give their fowls the necessary amount of protein, use one or other of the prepared mashes. These mashes are usually fed with grain, the birds being given an equal quantity of each. In these circumstances a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may therefore depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk, mash, and grain are being fed to the flock to give the birds all the grain that they will consume and not force them to eat given quantities of mash. This policy will largely enable the birds to balance their own ration.

Agricultural Notes

Manure Means Money.

THE unused dung of farm animals in Queensland must represent a great loss of national wealth each year. On almost every dairy farm one can see this waste from the freshly voided piles round the milking yards to last year's undisturbed cake lying bleached and useless in the field.

Idle dung is not only idle money, it is wasted money. About four-fifths of the food consumed by farm animals is excreted, and the fertilizing constituents of this manure are equal pound for pound to the best obtainable.

The urine soaks into the earth and soon makes its nutrients available to the plant roots, but the dung lies on the surface and if left unbroken may take years to decompose.

The direct results of this condition are readily observed. A definite area is temporarily spoiled for grazing, and when eventually grass grows around or through the heap it is completely ignored by stock until there is nothing else left. By this time the grass has aged, become harsh, and lost much of its nutritive value.

The indirect results are not usually recognised. Rats and other vehicles of disease revel in droppings, and transfer any infection to feed bins, troughs, and stored foods.

These disadvantages can not only be eliminated, but, by using a proper system of conservation and distribution, be converted to profit.

The material which accumulates in sties and stalls or where animals congregate can be readily collected and tipped into a nearby excavation. The excavated earth can be banked to form a run-off. A covering of palings, old posts, sheets of iron or other suitable material should be used to avoid trouble to stock and inconvenience to farm workers. Manure stored and covered in this way loses little of its fertilizing value. Manure piled in the open and exposed to the weather loses much by fermentation and leaching.

When land is to be manurured the pit can be opened and the material removed.

Where the paddocks are large and the droppings widely distributed a system of conservation is not practicable. In such cases periodic visits should be made with a rake and the dung under shade trees, around watering places, or along ''pads'' broken up and scattered. This allows the material to dry quickly and continuous tramping by stock soon works it into the soil.

The benefits derived from the farm manure are twofold. It supplies plant nutrients as well as an excellent medium for the production of humus—the organic water conserving colloid of soil.

The daily production of dung per 1,000 lb. live weight is approximately—

Cow	52 lb.
Horse	40 ,,
Pig	50 ,,

This means that on a farm running 35 cows, 4 horses, and 4 sows, there would be a weekly production of 6 tons. If only one-third of this could be collected it represents at least 100 tons of good fertilizer each year.

PROPAGATION OF GRASSES.

Frequently enquiries are received by the Department of Agriculture and Stock as to where seed of blue couch, Kikuyu, *Panicum muticum* (Para), and Guinea grass can be obtained. Kikuyu grass fails to set seed in Queensland, and little or no seed of commercial value is collected from stands of the other grasses.

Propagation is usually carried out with roots, runners, or plants, except in the case of Guinea grass which is reproduced from roots or plants only, as it does not send out runners. Supplies of the roots may best be obtained direct from the grower.

It is sometimes the practice to pass the runners of Kikuyu grass or Para grass through a chaffcutter set wide so that the resultant "chaff" can be broadcasted and harrowed in.

Blue couch should not be confused with the ordinary couch of Queensland, which can be grown from seed.

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PARA GRASS—USEFUL IN DAMP SITUATIONS.

Para grass—known in Queensland also as *Panicum muticum* and giant couch—is grown to a large extent in many tropical and sub-tropical countries. The grass is a rapidly-growing perennial, spreading by means of thick runners which grow along the ground and root at the joints. Vertical shoots are produced at the joints and reach a height of up to 5 feet. The runners spread very quickly, and the area occupied by the grass rapidly increases in size as the mat of foliage is produced.

Stock are fond of both leaves and succulent stems, but the trampling of animals may injure the runners, and under some conditions it is advisable to cut the grass and feed it green rather than graze it heavily. The feeding value of Para grass is fairly good.

Para grass has proved very useful on our coastal country. In North Queensland, it has established a good reputation and is widely grown. It grows best on moist or even swampy land, and a paddock on a wet portion of any coastal farm might well be planted with Para grass to provide a change of diet from paspalum. Heavy frosts cut the grass back rather severely, but recovery in spring is rapid.

Seed of Para grass is usually of poor quality; hence the planting of roots or stem cuttings is the usual method of setting out the grass. These may be planted on ploughed land in furrows or started by mattocking in on the edges of waterholes or damp patches. Roots may be purchased in most of the coastal districts. A small number of cuttings will multiply rapidly in warm, showery weather.

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RISK OF USING SALT BAGS FOR SEED.

The use of bags which had previously contained salt, for packing seed is attendant with risk, unless due precautions are taken.

Salt—particularly crude salt—chiefly because of certain impurities which it contains, absorbs much moisture from the air, especially in humid weather. Both the salt dissolved by this moisture on a bag used previously for holding salt, and the damp conditions caused by the salt, can be deleterious to the keeping qualities of the seed packed in it.

If old salt bags—because of the current shortage—must be used, it is advised that they be *thoroughly soaked* in successive lots of water, and then *completely dried* before use.

A good way of soaking is to fasten the bags below the surface of a flowing stream, if possible, for a few hours; the bags should be "thinned out" sufficiently to allow free access of the water to all parts. It is no use merely soaking the bags in one lot of water, and then spreading them out to dry. The job should be done completely, using several waters if necessary.

Horticultural
Notes

Lime for the Garden.

LIME is very useful in neutralising the excess acidity of the soil. It improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and it is an essential plant nutrient. When present in sufficient amount, it promotes some types of bacterial activity which convert the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common belief that the exposure of acid soil to sun and air ''sweetens,'' or reduces, its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or the loss of lime through leaching and absorption by plants. Acidity thus developed can only be counteracted in field or garden by the use of some form of lime. The forms of lime used for counteracting soil acidity are quicklime, hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked quicklime is formed by exposure to the air, causing it to become a very fine powder which can be spread quite easily. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of ground limestone are required to supply as much ''effective'' lime as is contained in 3 lb. of slaked lime.

The soil to be limed should be dug over and reduced to a good tilth, after which the lime should be uniformly spread, and then lightly worked into the top soil to a depth of several inches. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic matter content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime that it is necessary to add to a soil can be approximate only.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1⅓ lb. of ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or, still more, sandy soils can receive lighter dressings of approximately half the amount required for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not necessary always to add sufficient lime to neutralise soil acidity completely, as most garden plants grow well on slightly acid soils. This slightly acid condition will result only in the majority of garden soils after liming. Only for those plants listed below as very sensitive to acidity is it advisable to neutralise the acidity completely. Whilst many plants grow best on neutral soils, or on slightly alkaline soils, a considerable number of plants will tolerate fairly acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes, which will grow on acid soils, do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows approximately the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very Tolerant.—Potato, radish, strawberry, sweet potato, rhubarb, watermelon, pineapple.

Tolerant.—Bean, carrot, cucumber, turnip, crimson clover, maize, oats, tomato, cowpea, cabbage.

Sensitive.—Rape, red clover, sweet clover, white clover, peas, onions, lettuce, cauliflower.

MARKETING PASSION FRUIT.

With the coming of warmer weather, passion fruit growers should exercise greater care in the harvesting of their fruit. Fruit should not be allowed to fall from the vines, as fallen fruit quickly becomes crinkled, reducing its size and value to the retailer. By picking the fruit when it is showing half colour its marketing life will be greatly increased, and its selling value raised. Where a grower has a percentage of crinkled fruit, it should be included with marked and blemished fruit and packed separately from the uncrinkled fruit. While most retailers have no outlet for crinkled fruit there is, however, a good market otherwise for fruit of this description.

All fruit should be carefully handled and packed on the diagonal system, which gives the fruit the maximum of protection and display value, thereby enhancing its general appearance.

MARKETING BANANAS.

During hot weather, bananas which have been cut and left exposed to the sun for only a short period soon become quite unfit for sale, and the pulp is eventually reduced to a soft, ''boiled'' condition. Cutting should be done in the early morning, before the heat becomes severe, and care should be taken to keep the fruit covered completely, even from the early morning sun, while waiting to be carried or wired to the packing shed.

The fruit should at all times be handled with the greatest care—in fact, the less it is handled the better—and for this reason it is wise to have the packing shed right in the plantation, if possible. On cutting the bunch it should not be laid carelessly at the foot of the stem, which usually means it rests on a bed of sticks and dead weeds. A bed of leaves is easily and quickly formed if the bunch must be set down in the plantation, although a better plan is to carry it straight into the shed or to the end of the wire and there place it upright on bags or trash with the stalk leaning against a rail provided for the purpose. In this way, possible damage will be reduced to a minimum.

On being dehanded, the fruit should be allowed to ''drain'' for a few hours. Packing immediately after dehanding sweats the fruit in the case and makes bruising much easier. Care should be taken to ensure that fruit which is ''sprung'' or in the early stages of ripening is not packed, as it will quickly be reduced to pulp and be unsightly in a case of otherwise sound bananas. No fruit should be packed for Southern markets from bunches in which some of the fingers are already showing colour indicating ripening. The fruit should be dehanded just at the collar joining the fingers to the main stalk. The most suitable knife for this work is one of a sharp, flexible, and very narrow type.

There is a right and wrong way to separate the hands into singles, if a ''single'' pack is desired. Tearing the bananas apart endways often peels part of the skin from the fruit and also bruises the stem, thus setting up an entrance for organisms which cause blackend. The correct method of separating into singles is to grasp the cluster firmly with both hands at the stem end, then twisting one hand forwards and the other backwards, the fruit is separated easily and without any damage to the stalk end.

On completion of packing the cases should be packed on their sides in a cool, shady position to await transport to rail or market.

Should it be desired to use the "cluster" pack, the same method should be adopted, separating three or four instead of the single finger. If a cluster of three or five is used, a single banana should be added to make it a four or six. The secret of clusters is to have the fruit in twos.

THE CAPE GOOSEBERRY.

Actually, the Cape Gooseberry is not a true gooseberry, being of the same family as the tomato, potato, and tobacco. This fact suggests immediately the class of soil it requires and what would be a suitable location for its growth.

The Cape gooseberry is best propagated from seed, 1 oz being sufficient to plant an acre. Sow the seed in a carefully prepared seed-bed in the same way as tomato seed is sown. Cover the seed to a depth of half an inch, using a rich loam, with a fair percentage of dry horse manure, if possible. Keep the bed moist, but shading is not necessary under normal conditions. The young seedlings grow rapidly and should be ready to transplant in, approximately, eight weeks from sowing. Harden the plants off by reducing the watering gradually prior to removing the plants, but give the bed a thorough soaking immediately before lifting the young plants.

Plant in a well-cultivated field in rows 4 feet apart, and at a distance of 4 feet between each plant. Water the plants at the time of planting. If land requires fertilizing, apply as a top dressing 1 part of sulphate of ammonia to 2 parts of superphosphates. A small amount of sulphate of potash applied just before the fruit appears is an advantage.

Harvesting may commence approximately three months after transplanting. The season lasts two to two and a-half months, regulated to a large degree by the season of the year. A fair crop would be about 3,000 lb. of fruit per acre, although much heavier yields have been recorded from time to time.

The market price ranges from 4d. to 7d. a lb. locally. The demand for this fruit is good, with little chance of a glutted market. The fruit is sold as fresh fruit or for jam or preserves.

The chief troubles affecting the Cape gooseberry are downy mildew (control by spraying with the Bordeaux mixture 4-4-50); and soft, brown scale (control by spraying with white oil 1 in 56). Annual planting is recommended, but, if pruned back, the plants do quite well for two seasons.

SELECTION OF BANANA SUCKERS.

In planting a new area of bananas it is advisable to make a good selection of suckers. In every banana plantation there are stools which are above the average, and it is from these that growers should select material for future plantings. Some stools are outstanding in growth and quality production. For example, they may have remained free, or nearly so, from borer attack, or they may have benefited from better soil, greater amount of moisture, and other conditions in their immediate vicinity.

It is advisable for growers to mark these outstanding stools for use at planting time, noting the quality of the fruit which has been recently cut from them or which they are still bearing. This can be done by placing a stake against the selected stools or some other suitable means of easy identification at the time when planting material is required.

If by selection it is possible to produce a more open bunch of the Cavendish variety, it will be of benefit in so far that the harbourage for skin-blemishing insects is lessened, that the bracts are permitted to fall more freely from the bunch, and that individual fingers fruits are more exposed to sunlight—thus ensuring uniform development of the bunch.

THE FRUIT MARKET.

J. H. GREGORY.

DRY conditions have continued to the detriment of berry fruits and tomatoes in some districts. Bowen received good rains early in the month, and a good late crop of tomatoes was harvested. Southern Queensland did not share in the relief; notwithstanding this, good lines of most fruits have come on to the market, with good prices for all except tomatoes, which during the last week of the month fell from 10s. to 6s. to 7s. to 3s. Custard apples are now finished. New season's mangoes are making their appearance and selling at high prices. Stone fruits also should be seen soon and no doubt will be welcomed. Prices during the last week of the month were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Eights and Nines, 17s. to 21s. 6d.; Sevens, 14s. to 17s. 6s.; Sixes, 10s. to 15s.; Smalls, 8s. 6d. to 11s. 6d.

Sydney.—Cavendish: Eights and Nines, 19s. to 23s.; Sevens, 15s. to 19s.; Sixes, 12s. to 15s. Few specials higher.

Melbourne.—Cavendish: Eights and Nines, 21s. to 23s.; Sevens, 19s. to 21s.; Sixes, 17s. to 19s.

Adelaide.—Cavendish: to 22s.

Brisbane.—Lady Fingers: 2½d. to 10½d. dozen.

Pineapples.

Brisbane.—Smooths, 5s. to 8s. case; 3s. to 6s. dozen. Ripleys, 7s. to 8s. 6d. case; 3s. to 6s. 6d. dozen.

Sydney.—7s. to 11s. case.

Melbourne.—8s. to 12s. case.

CITRUS FRUITS.

Oranges.

Brisbane.—Common, 5s. to 8s.; Navels, 6s. to 10s. imp.

Lemons.

Brisbane.—6s. to 8s. Gayndah, 9s. to 13s.

Grapefruit.

Brisbane.—5s. to 8s.

Passion Fruit.

Brisbane.—6s. to 13s.; Seconds lower.

Melbourne.—18s. to 20s. half bushel.

OTHER FRUITS.

Strawberries.

Brisbane.—7s. to 10s. dozen boxes.

Sydney.—Trays, 3s. to 5s.; boxes, 6s. to 14s. Many lines were wasty.

Cape Gooseberries.

Brisbane.—5s. to 7d. lb.

Mangoes.

Brisbane.—11s. to 14s. per case. Growers are advised to keep the maturity standard high.

Papaws.

Brisbane.—Locals, 2s. 6d. to 5s.; Yarwun, tropical case, 5s. to 9s.

Sydney.—Tropical case, 8s. to 14s.

Apples.

Brisbane.—Granny Smith, 6s. to 13s.; French Crab, 4s. to 8s.; Others, 4s. to 9s.

Tomatoes.

Brisbane.—Locals, Green, 3s. to 7s.; Ripe, 3s. to 6s. Northern, 3s. to 6s. Few special lines higher.

Sydney.—Bowen, Yarwun, 2s. to 4s. Special repacks higher. Redlands, 3s. to 6s.

MISCELLANEOUS, VEGETABLES, ETC.

Cucumbers.—Brisbane, 7s. to 11s. Sydney, 16s. to 18s. Melbourne, 16s. to 20s. bushel.

Beans.—Brisbane, 5s. to 12s. bag. Sydney, 4s. to 12s. bushel. Melbourne, 5d. to 10d. lb.

Peas.—Brisbane, 4s. to 8s. bag. Melbourne, 3d. to 5d. per lb.

Carrots.—Brisbane, 3d. to 9d. bundle. Sydney, 8s. to 10s. case.

Parsnips.—Brisbane, 9d. to 1s. 6d. bundle.

Beetroot.—Brisbane, 3d. to 8d. bundle.

Celery.—Brisbane, Local, 6d. to 1s. 3d. bundle.

Rhubarb.—Brisbane, 6d. to 1s. bundle.

Cauliflowers.—Brisbane, 9s. to 12s. Inferior, 3s. to 8s.

Cabbage.—Brisbane, 3s. to 5s.

Marrows.—Brisbane, 4s. to 5s. dozen. Melbourne, 8s. to 10s. case.

Pumpkins.—Melbourne, £10 to £11 ton.

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APPLE JUICE AND TREACLE.

While Queensland and other Australian applegrowers are wondering what can be done to improve the apple situation because of the heavy reduction of exports caused by the war, it may interest them to know that science workers at the Bristol (England) University Research Station have produced a concentrated form of apple juice which contains 80 per cent. of sugar. This has already been used commercially for sweetening all kinds of confectionery and ''soft'' drinks, and soon it will be available in retail shops. The concentrate takes two forms—juice and treacle—and although both have an apple flavour, it is described as ''quite unnoticeable'' in such jams as strawberry and raspberry. The apple ''treacle'' can be used by the housewife for any purpose for which she would use ordinary treacle or golden syrup, and the juice can be used for jam-making or for cakes and other forms of confectionery. With jam it will set just as well as ordinary sugar. The juice is quite sweet as sugar, and the treacle a little sweeter. By adding pectin made from other parts of the apples, these science men have also succeeded in converting the apple treacle into a very appetising jelly. It is claimed also that it is possible to conserve the aroma and ''bouquet'' of the fresh apples, concentrate them, and put them back into the jelly.

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THE COUNTRYMAN'S SESSION

Sunday Morning Radio Service to Farmers

Every Sunday morning at a quarter to nine o'clock, a bright, topical, and entertaining programme of information on rural subjects is broadcast from National and Regional Radio Stations. (By arrangement with the Australian Broadcasting Commission.)

Farmers are recommended to tune in to—
4QS, 4RK (Rockhampton), or 4QN (Townsville).

EVERY SUNDAY AT 8.45 a.m.

Weather and market reports and a wide variety of farm topics.

OVERSEAS EXCHANGE.

Its Operation in Wartime.—The Necessity for Limiting Imports.

Subjoined are notes of an address by Mr. J. A. Butler, Acting Economist of the New South Wales Rural Bank, at the recent State Conference of the Agricultural Bureau of New South Wales, and reported in the AGRICULTURAL BUREAU RECORD, issued by the Department of Agriculture, New South Wales.

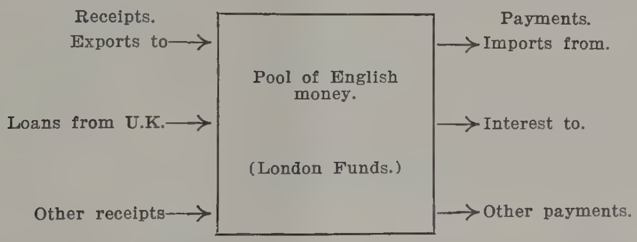
The first point to understand in relation to overseas exchange is that money does not go out of the country. This idea is a most important one, and if we understand it fully we have gone a long way towards understanding the whole problem.

If you buy an American tractor, the agent you buy it from does not send a cheque for so many Australian pounds over to United States of America. The tractor manufacturer would not have it; he would want to be paid in dollars. The agent has, in some way or another, to get hold of dollars so that he can make the payment in United States of America.

The United States is taken as an example because the difference between pounds and dollars is quite clear, but much the same would be true for making a purchase from the United Kingdom. If you purchase a British petrol engine, the Australian agent from whom you buy it will have to find some means of paying the British manufacturer in English pounds or, as it is frequently expressed, in sterling. Australian pounds are not the same thing at all as English pounds, and it is rather confusing that they have the same name.

How is the payment to the English manufacturer made? The answer is that Australian banks own a pool of English money which they keep in London and call by the jargon name of ''London funds.'' To make his payment in England, the agent who has sold you the petrol engine will go along to his Australian bank and ask to buy some of the English money from the pool in London. The bank will quite readily sell, charging the agent the rate of £125 10s. Australian for every £100 English bought. The bank will thus receive an amount of Australian money, and will give the agent a cheque on their London office, which will be sent over to the English manufacturer, and cashed by the London office of the bank from its pool of English money. When any payments have to be made overseas the bank thus receives Australian money in Australia and pays out English money from its pool in London.

You might now ask how the bank could keep on paying out from its pool of English money without this pool running dry. There must be some flow into the pool—and there is. If we sell wheat to the United Kingdom they pay us in English pounds. Again the Australian bank fills the function of an intermediary. It receives this money into its pool in England and pays out in Australia, Australian money to the dealers or farmers in Australia who have sold the wheat. Thus the pool of English money is continually filled by our sales to the United Kingdom and other receipts which we might have from the United Kingdom, and emptied by our purchases from the United Kingdom and any other payments which we might have to make in the United Kingdom. The operation may be illustrated by means of a diagram:—



At this stage it is appropriate to ask why we need to cut down on imports. It will be easy to understand from the above discussion and from the diagram presented that if the flow into the pool of English money is less than the flow out of it, the size of it would decrease and it would eventually become empty.

One of the consequences of a war is that large payments have to be made out of the pool by Australia for the purchase of war equipment and for paying and maintaining the A.I.F. overseas, and for contributing to the Empire Air Scheme.

Thus, the flow out of the pool is likely to be very much higher than normal, unless the flow out to pay for ordinary imports is checked. On the other hand, the flow into the pool is at a rather higher rate than during any pre-war years, but is hardly likely to be large enough to offset the flow out, unless ordinary imports are considerably restricted.

EXCHANGE WITH UNITED STATES.

Why it it that imports from the United States are especially being singled out for restriction? To answer this most important question, it is necessary to proceed somewhat further with our study of the machinery of foreign exchange.

When Australia exports to the United States, payment for the goods exported is made in dollars, but we do not follow the practice of keeping a pool of dollars in the United States in the same way as we keep a pool of English money in London. When we receive dollars for our exports, we immediately sell them in England and receive English money for them which we add to our single pool. On the other hand, when we have to make payments to the United States, such as for imports from that country, we take from our pool of English money in London and buy dollars which we then use for the payment of the debt. Thus exports to the United States add to our English pool in much the same way as exports to the United Kingdom, and imports from the United States subtract from the pool.

THE PURCHASE OF WAR EQUIPMENT.

This brings out the really important point. Exports to the United States and imports from the United States not only alter the level of our pool of English money, but also the United Kingdom's pool of dollars. Now the United Kingdom's pool of dollars is one of the most important factors in the present war situation. The United States has become an extremely important source of supply for aeroplanes and other war equipment. It is a very urgent matter for us to get these war supplies, but we have to pay for them in dollars, so that it is important that the pool of dollars owned by the United Kingdom is not used for the purchase of any thing which we can do without. It is, therefore, clear that the less we import from the United States at the moment, the more dollars are left free for the Empire to purchase war equipment in the United States.

AGRICULTURE IN BRITAIN.

We are all naturally interested in how the war is affecting farming in the Old Country. Drastic changes have been made, and made quickly, and British agriculture is now working under a broad, comprehensive scheme to ensure the people's food however long the country is forced to fight. In Britain, every private interest and every consideration of cost is being subordinated to the supreme aim of extracting the last ounce of food from every acre of farming land. The two main effects of the new policy are—first, a large increase in production; and second, a drastic change in the economic status of primary industry. It is remarkable, when you come to think of it, that in the last twelve months the British farmer has broken up more than 2,000,000 acres of new land, mostly grassland, and is expanding that immense area most energetically.

Of course, in such a disturbance of the ordinary routine in any country someone has to suffer individually for the common good. The specialist producer cannot escape from being hard hit. For instance, the poultry farmers have been called on to reduce stocks as all the available feeding stuffs are required to keep the dairy industry going at the increased rate of production. As a matter of fact, many of the specialist farmers may have to transfer their energies to some other branch of production.

As part of the general scheme, the wages of farm workers have been raised to something near the wages of other skilled workers, so that they may stick to the job in which they will be most useful to the country.

PUTTING THE "POT" INTO THE POTATO.

Germany claims to be making forty different kinds of dyes and colouring materials from the potato. In other processes of manufacture, starch and sugar are squeezed out of potatoes for use in chocolate factories, pastry shops, and breweries. Motor spirit also is made from potatoes.

Another German claim is the making of numerous other essential substitutes out of potatoes—such as vinegar, rum, and even beer. So the "pot" in the name of the potato means something after all.

Plate 100.

Yarded.—Blood mares and foals, Northampton Downs, Western Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of August, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Valera Sheila	Sullivan Bros., Valera, Pittsworth	12,887·09	656·96	Royalist of Strathdhu
Merravale Tulip 4th	W. Soley, Malanda	13,802·6	457·304	Greyleigh Honorarium
Melody 8th	J. C. Meier, Mount Mort	11,602·45	385·843	Blacklands Beauty Prince
Evansvale Bonnie	J. F. Evans, Malanda	10,368·2	353·263	Malanda of Glenora
	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Merravale Model 4th	W. Soley, Malanda	10,455·15	336·195	Greyleigh Honorarium
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Kyabram Betty	A. H. E. Black, Kumbia	10,466·33	509·898	Springlands Brigadier
Melody's Pearl	J. C. Meier, Mount Mort	8,893·15	343·611	Blacklands Beauty Prince
College Mayflower 3rd	Queensland Agricultural High School and College, Lawes	7,193·4	328·952	Trevlac General
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Blacklands Stately 4th	T. Ryan, Allora	6,219·15	316·747	Blacklands Major
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Sunbridge Broady 2nd	T. Ryan, Allora	10,377·4	418·712	Blacklands Royal Star
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Kyabram Betty 2nd	A. H. E. Black, Kumbia	6,127·07	284·944	Berry Joker
Sunnyside Empress 65th	P. Moore, Sunnyside Stud, Wooroolin	7,533·55	283·71	Cosey Camp Rupert
Ardilea Kitty 2nd	W. Hinrichsen, Ardilea, Clifton	6,785·9	277·278	Midget Sheik of Westbrook
Happy Valley Linda	R. R. Radel, Happy Valley, Coalstoun Lakes	6,209·0	241·902	Sunny View Artist
Trevor Hill Melba 2nd	Geo. Gwynne, Umbiram	6,233·6	239·228	Corunna Supreme

JERSEY.

MATURE COW (STANDARD, 350 LB.).				
Trecarne Rosella 4th	T. Petherick, Trecarne, Lockyer	9,424·5	589·713	Trinity Officer
Jolly Jean of Glenmoore	S. H. Caldwell, Walker's Creek, Bell	8,960·12	512·963	Glenmoore Jolly Jester
Overlook Remus Sweetie	J. Sigley, Millaa Millaa	7,691·45	449·385	Overlook Ginger Remus
Trinity Golden Beauty	A. H. O. Koppen, Peeramon	6,936·25	406·599	Trinity Dreaming Pioneer
Fauvic Countess	A. T. Meyers, Valoma, Theebine	7,416·85	399·795	Earl of Roselands
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Hopewell Cinderella	Geo. Harley, Childers	5,714·85	310·157	Carnation Queen's Golden
Banyule Tiddlewinks 25th	Young Bros., Kingaroy	5,691·85	272·965	Banyule Oxford Don
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Woodside Orion	F. P. Fowler and Son, Glenview, Coalstoun Lakes	6,556·3	316·013	Rochettes Volunteer (imp.).
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Maudlands Luxury	L. J. Comiskey, Warra	7,070·48	371·273	Grasmere Calm 2nd's Progress
Strathdean Gentle Frolic	S. H. Caldwell, Walker's Creek, Bell	6,279·11	349·365	Glenmoore Gentle Volunteer
Hadleigh Lily 16th of Grasmere	T. W. McMiken, Southbrook	6,008·37	286·23	Grasmere Floss 12th's Dan
Fauvic Buttergirl	H. Cochrane, Fauvic, Kin Kin	4,487·35	235·908	Austral Park Sheik
Woodside Merry Princess	F. P. Fowler and Son, Glenview, Coalstoun Lakes	4,651·95	230·542	Rochette's Volunteer (imp.).

The Young Farmer

THE WONDERFUL WORLD OF THE BEES.*

J. A. WEDDELL, Research Officer.

WHEN it was first suggested to me that I might speak to you on bees I was for a while undecided on a very important point. Should I talk to you about the honey bee, or should I discuss the many other kinds of bees? I finally thought it better to concentrate on the honey bee, which is so important in many ways, and in which I hope some of you are interested in connection with School Project Club work, and from which almost anyone may draw interest and profit either as a hobby or as a means of livelihood. I would like to point out, however, that the honey bee is only one species in a large family of bees. The honey bee was introduced into Australia by one of the very early settlers, in February, 1810. In addition, there are many small wild bees native to Australia which also gather honey and pollen, but these are unsuitable for our purposes. Again, there are carpenter bees which make holes in suitable dry timber for their nests, leaf-cutting bees which remove neat crescents from the leaves of certain plants and use the pieces for the purpose of making or lining their nests, and bees which make their nests by digging galleries into sandbanks and other soft soil. All of these, however, would be too long a story for to-day, and we shall look only at the honey bee.

Exploiting the Honey Bee.

In these days of a plentiful supply of sugar from sugar-cane and sugar-beet it may not be realised that for many centuries in the past honey was the only food-sweetening material available to man, and, again, that while to-day we have materials like paraffin wax, synthetic resins, and other wonderful products of the modern laboratory, the not-so-ancients depended quite a lot on beeswax for modelling, waterproofing, polishing, and so on. In spite of the importance of these products of the hive, i.e., honey and beeswax, developments in the manner of handling bees have been only slight. This is due to the fact that even to-day the honey bee is still essentially a wild animal. A horse, a cow, an elephant, or a dog becomes and remains docile under kind treatment, but the honey bee will always sting unless handled with great discretion. In beekeeping, then, we do not domesticate the bee, we simply provide a suitable house for it from which it is most convenient to rob it at intervals.

If honey bees swarm away from the hive into the bush they usually select a hollow log or tree, and in this they build their wax cells for the storage of food and the development of their young. Thus, all that is necessary for their home is some secluded hollow. The early hives were simply hollow containers of various shapes and materials, baskets, woven straw, mud structures, and wooden boxes being some of the types. They all suffered the same disadvantage that when the hive was robbed for the removal of honey and wax the whole life of the hive was disorganised and the brood was killed. Nowadays, bees are kept in frame hives—that is, hives fitted with light wooden moveable frames. A thin sheet of wax known as foundation wax is placed in each frame and the bees work new wax on to the foundation and build up the typical wax comb. You must understand that the bees could do it all themselves in an empty box, but for his own convenience it is better and necessary for the beekeeper to have the comb readily removable from the hive. So much so that in Queensland it is provided that the bees should be kept in frame hives.

Life in the Hive.

You all know that the bee stores honey in the cells of the comb, but the comb has another important use. A large number of the worker bees in a hive are nurse bees, and these bees look after the cleanliness of the hive and care for the brood or young. They clean out numbers of cells each day and the queen immediately lays a small white egg into each cell. Let us watch one of these eggs closely and see what happens to it. In about three days it hatches and there emerges a small white grub. This grubs rests in the bottom of its cell and it is fed by the nurse bees on food compounded by them from honey and pollen. It grows until, at the end of about six days, it almost fills its cell and is full-grown. At this stage the nurse bees seal the cell off with a thin cap of wax. The grub now changes into the pupal stage from which it finally transforms into an adult bee after about another twelve days. The bee pushes its way from the cell, and for a day or two it remains quietly on the comb from which it has emerged. After a few days it begins its own work as anurse bee, caring for and feeding the grubs and the queen, cleaning and ventilating the hive, building new comb, and guarding the hive from intruders. After it is about a week old our bee will probably choose a bright day and in company with others about its own age will bravely emerge from the hive and go for a short circling flight, keeping very close to home. Every few days it will go for longer and longer flights, always returning to the hive and busying itself most of the day with the nurse bee duties. However, when our little bee is about two to three weeks old it drops inside duties altogether and starts its new duties of gathering nectar, pollen, propolis, and water. I shall tell you something of these materials in a moment or two. For the remainder of its life the worker bee is a forager, leaving the hive at sunrise and working until evening. If there is suitable material nearby the individual flights are short; if the foraging is poor, the bee may need to make flights of two, three, or more miles. After strenuous work of this kind for from one to three months the bee is reaching old age and its wings are becoming frayed. Finally, there comes the day when it cannot fly back to the hive with its load, or it arrives in such an obviously weak condition that the nurse bees then in charge of the hive recognise its weakness and push it out. Only vigorous healthy workers are required or tolerated in the hive. The life span of a worker bee is from two to four months.

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* This is the text of a School Broadcast delivered through Stations 4QG, 4RK, 4QN, and 4QS on 2nd July.

If there should be too few nurse bees in the hive some of the foraging bees will resume the nurse bee work, and, alternatively, if for any reason there should be more nurse bees than are necessary some of them will start foraging earlier in life than is usual. I should like to emphasise the wonderful nature of this organisation of work, particularly in view of the large number of bees, anything from 40,000 to 60,000 living in each hive.

Nectar Gathering.

The most important duty of the foraging bee is to gather nectar from flowers. This it does by sucking, and the nectar is carried in a honey-stomach which is separated from its digestive stomach. Many flowers need to be visited and then the bee returns to the hive. The nectar is passed over to nurse bees, and finally stored in a cell in the comb, and gradually the store cells become filled. When first gathered the nectar is too thin and watery for honey so that the filled cells are left unsealed for a time by the bees. Some of the water evaporates, certain chemical changes take place, and the nectar ripens into honey. At this stage the honey will keep indefinitely without going bad and the nurse bees seal over the filled cells with wax capping.

Pollen Gathering.

While the bee is pushing its way into a flower to reach the nectar it rubs against the pollen in the flower and the pollen grains stick to the tiny branched hairs that clothe it. The bee then rubs its legs over its body and collects the pollen into special pads on its hind legs, called pollen baskets. This pollen is taken back to the hive and stored in certain of the cells in the comb. You must understand that the object of all of this work by the bee is to store honey and pollen so that these can later be used for feeding the young ones.

In moving from one flower to another a bee, of course, cannot collect all of the pollen from its body and some of the pollen grains become rubbed off in the next flowers. As you know from your natural history lessons the transfer of pollen fertilises the flower and makes possible the development of seeds. Hence the bees are unconsciously and continually carrying out a wonderful piece of work for farmers, orchardists, and gardeners.

Building the Wax Comb.

The wax of the hive is produced in a wonderful manner by the nurse bees. Those producing wax hang in festoons in the top of the hive and the temperature rises to about 97 deg. F., that is, about the temperature of our bodies. Tiny beads of wax then commence to appear on the under sides of their bodies from special wax glands in much the same way as beads of perspiration come out on our skin. As the wax comes in contact with the air it hardens into tiny scales. These scales are then wiped off, moulded together, and placed where they are wanted for the building of comb. The honey comb is a most wonderful structure. It consists of a central wax partition hanging down vertically and on each side it is built out into neat regular six-sided cells. If I were asked to draw a regular six-sided figure, that is, a regular hexagon, I would need a pair of compasses, a ruler, and a pencil, but the bees work so wonderfully that one bee after another places down a little bit of wax gradually building up the framework and the result is a piece of exact modelling. The cells are also shaped so that they do not jut out exactly horizontally, but they have just sufficient upward tilt so that the nectar and honey will not pour out or drip. Of course, when comb is built in a rough frameless hive, such as in a hollow log, the main lines of the comb will probably be twisted, but when the bees are given the opportunity of building in a proper hive the lines are beautifully regular.

Wax is a very valuable material in a hive, for the bees that produce it need to feed heavily on honey. It has been estimated that for each pound of wax produced, the worker bees need to eat about twenty pounds of honey.

Miscellaneous Duties.

In dry, hot weather the bees need to take water to the hive, and if you watch closely round a pool of clean water, or the wet patch under a dripping tap, on a hot day, particularly if someone is keeping bees nearby, you will see bees come down and sip the water.

I mentioned propolis a short time ago. Propolis is a material which the bees collect from trees; it is a resinous or gummy exudation. In the hive it looks and feels like very dirty beeswax, and it is used by the bees for sealing up unwanted openings in the hive. In a natural log hive the bees would close the broken opening with propolis except for the small necessary entrance; if a box hive warped and the sides cracked the unwanted openings would similarly be sealed up.

A little earlier I mentioned the temperature in a hive, and you will probably be surprised to learn that the bees very largely control the temperature themselves. On a hot day numbers of the nurse bees stand at the entrance and fan with their wings, and other bees inside direct the currents of air round the hive. In cold weather the bees crowd together, if necessary using only part of a big hive, and also may block up part of the entrance so as to prevent undue ventilation and draughts of cold air.

My time to-day is almost gone and I have had to miss out a lot of interesting information. However, I hope that when opportunity offers you will read about bees, for although bees are certainly small they are not insignificant. The amount of honey and beeswax produced in the world is valued at several millions of pounds every year.

KEEPING OUR BALANCE IN THE SOIL BANK.

A soil is productive in proportion to its capacity to supply to growing plants the elements required for their development. If we look upon the soil as a bank in which we have an account, we will realise that the producing power is largely in proportion to what we have on deposit. When we open our account, the bank supplies us with a cheque-book so that we may draw on our account at any time. When we begin to operate on our account by drawing a cheque, there is so much less in the bank according to the amount so withdrawn. As our account dwindles we realise the necessity of depositing more money in our account.

Our account with the bank may be regarded as a parallel with our account with the soil—the soil on our farms represent a bank. Nature supplied the soil in its original state with certain deposits of plant food—nitrogen, potash, phosphorus, and other elements necessary for plant growth. For years the land on our farms has been tilled. The crops produced represent cheques drawn against the original deposits of nitrogen and other elements. If these elements are not replaced in amounts corresponding to the amounts absorbed by the growing crops, the soil eventually gets into exactly the same condition as a depleted banking account. It refuses to honour the draft made on it by the crop we have produced. Therefore, if we are to continue to grow crops we must put back into the soil the same amount of chemical elements which the crops take out of it. In this year of national emergency, the production of bumper crops is of prime importance. For this reason the maintenance of plant food in our soil in proper proportion to ensure maximum crop yields is more necessary than ever before.

General Notes

Staff Changes and Appointments.

The appointment of Mr. B. B. Brett, New Angledool, New South Wales, as a temporary honorary inspector at Habnarey Gate has been cancelled, and Mr. E. H. Best, Yarranbah Station, New Angledool, has been appointed honorary inspector of stock to fill the vacancy.

Messrs. M. E. Playford (Assistant General Manager, Mount Morgan Ltd.), B. G. Patterson (Mount Morgan), and H. A. Kendrick, Senr. (Burleigh Heads) have been appointed honorary protectors of fauna.

Mr. A. W. McLauchlan, field assistant in the Poultry Section of the Department of Agriculture and Stock, has been appointed also an inspector under *The Diseases in Poultry Acts.*

All inspectors of stock, slaughter-houses, dairies, and plants, Department of Agriculture and Stock, have been appointed also protectors under *The Fauna Protection Act of* 1937.

Mr. A. C. Peel, Department of Agriculture and Stock, has been appointed an inspector under *The Seeds, Fertilisers, Veterinary Medicines, Pest Destroyers, and Stock Foods Acts.*

Fauna Sanctuary at Drayton.

''Southdown,'' the property of Mr. H. B. Shennan, at Drayton, has been declared a sanctuary under and for the purposes of *The Fauna Protection Act of* 1937.

Mourilyan Mill Levy.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Mourilyan mill suppliers' committee to make a levy for administrative purposes at the rate of twopence a ton on all cane crushed during the 1940 season.

The Peanut Industry.

A Proclamation has been issued under *The Peanut Industry Protection and Preservation Act* declaring that section 17 shall be made applicable to the following diseases of peanuts. Seedling blight, wilt, leaf spot, chlorosis, bunchy plant, leaf curl, and rosette disease. It is provided that the occupier of land shall give notice of the appearance of any of such diseases to an inspector or the Under Secretary, Department of Agriculture and Stock.

Additional regulations to give effect to the provisions of the Act also have been issued.

Goondi Mill Levy.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Goondi mill suppliers' committee to make a levy for administrative purposes at the rate of twopence a ton on all sugar-cane supplied during the present season.

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NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Cockatoo Grass, Swamp Millet, Woolly Finger, and Rat's Tail Grasses.

H.R. (Kenilworth)—

1. *Alloteropsis semialata,* Cockatoo Grass. This grass is a native of Eastern and Northern Australia, and extends to Southern China, India, and Africa. In south-eastern Queensland it is particularly common on the poorer sandy country. It is not a very good fodder species.
2. *Echinichloa Walteri,* sometimes called Swamp Millet. It grows nearly always on the edge of creeks and in similar situations, being recognised readily by the reddish bristles of the seed head. Cattle and horses appear to like it. The grass is believed to be a native of the east coast of the United States of America.
3. *Digitaria eriantha*(?), a woolly finger grass. Several species of Woolly Finger Grass have been introduced from Africa into our grasslands. There is a native species known as Summer Grass, *Digitaria adscendens,* which it very closely resembles. Your specimen may be a very robust form of this, and in the absence of the base of the plant it is difficult to be sure of the identification.
4. *Sporobolus capensis,* a rat's tail grass. This is a native of South Africa, but is now widely spread over the eastern seaboard of Australia. It is a coarse tussocky grass, and is only eaten by stock in its younger stages.

"Peanut Tree" (Sterculia foetida).

J.P.R. (Port Douglas)—

The specimens represent *Sterculia fœtida,* a native of India and Malaya. The specific name ''fœtida'' comes from the unpleasant odour given off by the flowers, and is simply Latin for fœtid. The seeds of the present species are eaten roasted, we believe, in India. We have a closely allied species in Queensland. It is particularly common in some parts of North Queensland, especially on the islands of Whitsunday Passage, and is sometimes called ''Peanut Tree.'' It has large red pods, smaller, however, than those of your species, and has black seeds, which, after the shell has been removed, make quite pleasant eating. The Bottle Trees and the Kurrajong are placed by some botanists in the same genus *Sterculia,* but most now regard this as belonging to a separate genus *Brachychiton.*

Stagger Weed. "Catch Fly." "Fat Hen."

B.W. (North Tamborine)—

The specimens have been identified as follows:—The plant with the yellowish-green leaves, and small lavender-coloured flowers borne in whorls or circles, is the Stagger Weed (*Stachys arvensis*). Our experience has been that this plant is harmless for ordinary resting paddock stock, and animals have to be excited or worked before any symptoms of ''staggers'' or ''shivers'' are shown. Most dairymen look on it as a good fodder. Working horses, however, get staggers or shivers after feeding on the plant.

The other two weeds are *Silene gallica,* the French Catch Fly, and *Chenopodium album,* the Fat Hen. Neither of these plants is known to possess any poisonous or harmful properties.

Swamp Millet.

C.R.T. (Mackay)—

The specimen is Wild Millet or Swamp Millet (*Echinochloa crus-galli*). This grass is very widely spread over the warmer regions of the world, and several forms of it occur in Queensland. The one you send is most abundant in rather swampy areas. It is a valuable grass for stock, and is very closely allied to and probably one of the wild parent forms of such well-known cultivated fodders as Japanese Millet and White Panicum.

South Burnett Plants Named.

D.T.C. (Barlil, via Murgon)—

1. *Eragrostis cilianensis*, Stink Grass. This is a common weedy grass in cultivations and gardens. The common name arises through the odour emitted by glands along the margins of the leaves. Probably because of this odour, it is not usually eaten by stock.
2. *Cynodon dactylon*, Common Couch. Along creek flats and in similar situations this species forms quite a dense sward and provides useful fodder for stock. In one form or another it is widely spread in coastal and inland Queensland. It is often used as a lawn grass.
3. *Echinochloa colona*, Barnyard Millet. This grass is widely spread over the subtropical regions of the world. In Queensland, it usually only grows where the ground has been disturbed, and does not occur in any great quantity. It is good feed for cattle, being closely related to such well-known cultivated fodders as Japanese Millet and White Panicum.
4. *Eleusine indica*, Crow's Foot Grass. Quite solid tufts are usually formed by this grass, and in New South Wales it is regarded as a bad weed of cultivation. At times it contains a prussic acid yielding glucoside, and has been suspected of poisoning calves.
5. *Chloris virgata*, Feather Top Grass. It is a member of the Rhodes Grass genus, but unlike that species, rarely seems to be eaten by stock.
6. *Brachiaria foliosa*, Leafy Panic Grass. In shady and more moist places this grass is generally to be found. It is quite good feed for cattle, but rarely occurs in sufficient amount to affect ordinary pasture.
7. *Cyperus fulvus*, a sedge. On the whole, the sedges have not the fodder value of grasses, and they mostly grow in and around water.
8. *Fimbristylis dichotoma*, a sedge. This species is often quite common among the larger tufts of grasses in the ordinary pasture.
9. *Eragrostis leptostachya*, Paddock Love Grass. At times this forms quite a large amount of the feed in some paddocks, and is quite a useful species in the average mixed native pasture.
10. *Paspalidium gracile*, a native Paspalidium Grass. This often occurs in shady places, and on the tops of hills is sometimes quite common. It generally shows signs of having been eaten.
11. *Echinochloa crus-galli*, a Wild Millet. See No. 3.
12. *Paspalum dilatatum*, the common Paspalum. This is the main dairying grass of subtropical coastal Queensland and Northern New South Wales. It is a native of South America, but has been naturalised here for many years. The fungus on the seeds known as ergot has caused trouble among dairy cattle in many areas.
13. *Chloris divaricata*, a Star Grass. A very common grass, but of little use.
14. *Alternanthera repens*, Khaki Weed. This has been declared a noxious weed throughout Queensland. In some districts, it is known as Bindy-eye.
15. *Gnaphalium purpureum*, Cud Weed. This is generally looked on as a quite useful herb in the native pasture.
16. *Stachys arvensis*, Stagger Weed. This is generally eaten without harm by paddock stock. However, if horses or bullocks are worked after feeding upon it, they begin to show symptoms of staggers. It also taints milk slightly.
17. *Cyperus rotundus*, Nut Grass. This is a troublesome weed, being practically impossible to eradicate.
18. *Bromus unioloides*, Prairie Grass. This is winter-growing grass, which reaches maturity in the spring and early summer. It is quite good feed, and is sometimes cultivated for this purpose, although better kinds are generally available.

"Pear Tree."

N.L.K. (Charters Towers)—

The plant you send is *Terminalia platyphylla*. The name we have mostly heard applied to this plant is "Pear Tree." Of course, it is not a member of the Rosaceae like the ordinary pear, but belongs to a comparatively small family, Combretaceae. Some of these Terminalias make excellent shade trees in the Gulf country. One rather distinct from the rest is *Terminalia cattapa*, the Fiji Almond, which is largely used as a street and esplanade tree about Townsville.

Guinea Grass.

W.B. (Bracalba)—

The specimen is Guinea Grass, *Panicum maximum*. This grass is naturalised in many parts of Queensland, and is especially abundant on some of the fruit farms of the North Coast line, where it comes up as a weed. It is a very good fodder, which is relished by all classes of stock. The difficulty has been in obtaining a satisfactory seed supply, as the seeds lose their vitality very quickly after gathering. The plant can be usually spread by root division. Some varieties, we think, are an improvement on the normal form, and have been introduced into Queensland in recent years. One of the best of these is the sort known as Green Panic, or Fine Leaved Panic Grass, *Panicum maximum* var. *trichoglume*. A small plot of this grass for periodical cutting and feeding-off is a desirability.

Purple Top Chloris Grass.

H.T.V. (Gumlu)—

The specimen is *Chloris barbata*, Purple Top Chloris. This is a robust grass with stout creeping stems similar in general appearance to Rhodes Grass, but usually somewhat smaller. It is easily distinguished by its purple seed-head. It is frequently called in North Queensland, Purple Top Rhodes Grass, sometimes simply Purple Top Grass. It is very common in Queensland along the coastal belt from Port Curtis northwards, and has been found as far west as Julia Creek. On the whole, it favours old cultivation areas and other places where the ground has been disturbed. It is very common along railway embankments and roadsides, but is seldom seen in undisturbed pasture lands. The general opinion is that it is rather a poor fodder, but we have seen the grass when kept short eaten quite readily on a face with other grasses and herbage.

Geebung. Tumbling Mustard. Cud Weed. Milk Thistle.

F.C. (Kuraby)—

1. *Persoonia media*, Geebung. A small tree of the family *Proteaceae*. Some of the Geebungs have much narrower leaves than the one you sent, but this is the common one about Brisbane. The fruit, when ripe, is edible, though we have never found them in anything but a very acidulous state. So far as we know, the bark of Persoonia has not been used as a tanning agent. The tannin content is not known.
2. *Sisymbrium orientale*, Tumbling Mustard.
3. *Gnaphalium purpureum*, Cud Weed.
4. *Emilia sonchifolia*. A common weed allied to the Sow Thistle, and sometimes called Purple Sow Thistle or Milk Thistle. A very closely allied species of Emilia is grown in gardens as an ornamental under the name of Caccilia.

None of the plants is known to possess any poisonous or harmful properties.

Kangaroo Grass.

D.McW. (Toowoomba)—

The specimen is Kangaroo Grass, *Themeda australis*, a valuable native grass relished by all classes of stock. Its chief disadvantage is that it does not stand up to heavy stocking. The grass would grow quite well under cultivation, but seed is not always available through ordinary commercial channels. If, however, you are interested in getting this grass on to your property, the best plan, we think, would be to gather the seed yourself. This could be done in the rough, the seed-heads scattered about, and stock allowed to trample them in.

Tree Lupin.

W.J.E. (Zillmere)—

The Tree Lupin (*Lupinus arboreus*), so far as we can find, is not known to be poisonous, but in view of the fact that so many species of Lupins are poisonous to stock, it is a dangerous practice to feed any of them indiscriminately. The general experience has been that the plants have to be eaten in considerable quantity before any trouble ensues. There is very little likelihood of any trouble being caused by a few bushes in a garden or thrown over a fence to a home cow. Most trouble with the Lupins has been experienced in the United States, where many species are common plants on the sheep and cattle ranges. Trouble also has been caused in Europe, from both wild and cultivated species.

Rural Topics

A Land Girl on War Service—And a Barber Beards the Barley.

Here is a story from an official bulletin issued by the British Ministry of Agriculture—an unusual source of light-hearted humour:

It is the tale of a member of the Women's Land Army who went into training on a mixed farm. Last September she was a nineteen-year-old student of economics at the London University with no farming knowledge at all, and not even able to drive a car—which is something exceptional for a modern ''miss.'' Machinery had little interest for her, but she was put on a tractor and given lessons in milking. After a fortnight, the owner of the farm offered her a job for ''six months or the duration.'' Soon she was milking every morning and ploughing every day—when weather permitted. On wet days she painted farm machinery!

Such are fruits of enthusiasm and eagerness to serve, although it must be said that the girl herself says she has never been so happy in her life.

The same official bulletin reveals that one of the best ploughman of Leicestershire's War Agricultural Executive Committee was, until recently, a barber who knew nothing about ploughs or tractors. ''He is now able to plough a field,'' the committee reports, ''without supervision, and the results of his work are highly commended.'' The question is, will the barber ''beard'' the barley. No doubt, a steady hand and a good eye help him in his new job of ''trimming up'' the land.

But what counts for most in these things is the willing spirit and the big heart displayed by Britain's new recruits to the very important job of food production in war time.

The Submarine and Machinery for British Farms.

Despite the submarine ''sink-at-sight'' campaign, shipments of agricultural machinery are still being delivered in large volume to Britain for the ''speed-the-plough'' plan on British farms. There have been few losses of tractor consignments. This is important, because substantial shipments of tractors are made from America in the ordinary way, and they are doubly valuable to-day.

Although it is supposed that losses are usually covered by insurance—a sort of a ''sinking fund,'' so to speak—there is actually a loss to the importers, since there is no goodwill to be got by sending tractors to Davy Jones and his team of mermaids.

Refrigeration for Hire.

The freezer locker plan is gaining ground rapidly in rural districts in the United States. Under this plan a cold store is built in a central place. In this cold store there are individual refrigerated lockers which are let to farmers and others to enable them to store for their own use fresh foods and other commodities. In all the States of the Union these community refrigeration plants are multiplying rapidly.

Refrigeration is gaining ground remarkably in Queensland, and the home refrigerator is coming into use to an ever increasing extent. Even if electric power is unavailable, the kerosene ''fridge,'' is a most useful job. The obvious thing is to make primary production in all its forms reasonably profitable so that every farm will have its freezer.

Milk in the Cooler.

Cooling aerates milk which, as it passes in a thin film over the cooler, allows any animal or fodder odours to pass off. Cooling also means a slowing down in the rate of multiplication of germs that may have found their way into the milk, so that the milk keeps fresh and sweet over a much longer period. After milk has been cooled, we should not undo what we've done by exposing the cans to the hot rays of the sun. The same applies to cream which, of course, should be completely shaded when left on the side of the road for the factory lorry to pick up.

"Save Your Soil or Perish."

Losses by soil erosion are regarded very seriously in the South. In fact, in some places farmers are asking business firms to include a slogan, such as ''Conserve your Soil or Perish,'' in all their advertising.

In one district soil erosion has reached such alarming proportions that there is a definite need to educate landholders on the necessity of soil conservation.

In discussing the matter, a business man in a town in New South Wales suggested that the slogan should be ''Stop cutting down the Timber on the High Country and there will be no Soil Erosion.'' In one locality, it is said that the clearing of timber from the mountainside has been the cause of 95 per cent. of the property destruction that has occurred.

Italy had a similar problem; so engineers were called together. They had pits dug on the mountain sides and trees planted. The rain filled the pits, supplying moisture to the trees and soaking to the soil below. To-day this region is completely reafforested, and what was formerly a ruined area is fast being reclaimed for profitable production.

Old " Dobbin " Wins—From the Plough to the Racecourse and Back Again.

Here is a story from England that gives point to the revival of horse power on the farm—and off the farm, too. ''Sawfish'' is the farm horse which won an important steeplechase at Liverpool (England) recently. He is certainly a remarkable animal. Usually we hear the story of the Cup winner earning an honest living in his old age between the shafts of a milk cart, so this yarn may sound like a step in reverse. ''Sawfish'' got his race training working on a farm, with an occasional gallop in a neighbouring paddock. He was entered for the steeple' and was brought to the Aintree racecourse in his owner's cattle trailer, and, although bought originally for £4 10s. at a sale, won the event in great style! After this, it would be expected that the owner would value him very highly and would be unwilling to part with him. Such, however, was not the case, for soon afterwards ''Sawfish'' was put up for sale. And the reason? The owner wasn't worrying about winning more races, he wanted to buy a tractor with the money and grow more food in the ''Plough for Victory'' campaign. The steeplechaser is now working on another farm doing his bit for Britain.

Poetry in Agriculture—The English Scene.

Here is another example of how spring affects officialdom with its light and airy spirit. This slab of poetic expression from an official bulletin of the British Ministry of Agriculture which came in the post recently. ''The pattern of the English scene has altered, with more frequent splashes of ploughland breaking up the green of the predominant permanent pasture.'' And, again, ''Never have so many tractors been working through the night, so that many a village hears the *hum of machinery under the stars through the hours of darkness.''*

Speaking of the ''hum of machinery under the stars through the hours of darkness'' makes us think that the jazz band has at last accomplished what music-lovers and critics pessimistically predicted, that is, that the ear would soon become insenstive to any extraneous noise whatsoever, and that no distinction would eventually be made between a pneumatic drill and an oratorio. Of what use, then, would the ''Cradle Song'' be, if a running tractor engine would rock us to sleep just as quickly? However, remarkable progress has been made in tractor engine manufacture since American jazz assailed our ears, and it is no exaggeration now to call the running of a tractor a ''hum,'' yes, a hum like a sewing machine.

A Showdown at the Show.

An amusing incident occurred at the Brisbane Show when two well-known graziers were having a long conversation on the John Macdonald Stand. Each, apparently, wanted to get away without seeming to be discourteous, and eventually some excuse for parting was found plausible enough. Within very little time both friends found themselves at the Show Post Office writing out telegrams almost elbow to elbow. One of them remarked rather sheepishly about the nuisance of having to send important business wires while at the Show; but the other, a trifle more candid, exclaimed, ''Yes, what have you backed?'' The shot hit the mark and the real confession came out on both sides without loss of time or words. Both were on the winner of the Ascot Handicap.

Farm Notes

NOVEMBER.

WHEAT-HARVESTING will become general in November, and now is the time to see that all field equipment—header-harvesters, tractors, and other machinery—is in thorough working order. All working parts should be oiled and examined and necessary readjustments made in order to avoid the risk of stoppages in busy times.

Rust is not the menace that it used to be, now that more or less rust-resistant wheats are in general cultivation. Three Seas and Seafoam wheats are moderately resistant, while other varieties—such as Flora and Florence—usually ripen early enough to escape rust.

November is regarded as the best time for the establishment of the main maize crop, because the tasselling period coincides usually with normal summer rains. Too much attention cannot be given to the preparation of land for maize, which should now be well advanced, for no amount of inter-row cultivation will overcome the retarding influence of faulty initial preparation. Inter-row cultivation should become progressively shallower as growth proceeds, and may be discontinued at the cobbing stage.

Increased attention is being given to the growing of grain sorghums, chiefly in districts where the rainfall is insufficient to assure profitable yields from maize. Yields up to 12 bags to the acre have been obtained under conditions fatal to maize, while the capacity of header-harvesters to deal with the new dwarf-growing varieties is a big factor in economical production.

For intermediate crops, the rapidly maturing millets, Japanese millet and white panicum, can be recommended for present sowing, being suitable for grazing, silage, or hay. If seed production is desired, preference should be given to the variety known as Giant Panicum or Giant Setaria, and to the French millet.

Local potatoes and onions will now be arriving on the market, and, in order to obtain the best possible returns, attention should be given to grading, and to marketing produce in good, clean bags. To retard infestation by the potato tuber moth, the potatoes should be bagged and removed from the field without delay, for if exposed overnight, some infestation may occur during storage.

The planting of peanuts will be continued in the main South Burnett districts, where Virginia Bunch and Red Spanish are the principal varieties grown. Growers are reminded of the better germination obtainable if seed is treated with a fungicide before sowing.

In addition to the crops mentioned, seasonal sowings of Sudan grass, broom millet, buckwheat, pumpkins, and melons can be made, and cow cane and sweet potatoes planted out.

Where broom millet is grown as a sideline, it is sometimes preferable to make small successive sowings so as to spread the harvesting over a longer period.

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CAROB BEAN.

The Department of Agriculture and Stock has a limited quantity of Carob Bean seed on hand, and is prepared to supply seed samples to interested farmers and graziers on application to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

The Carob Bean is especially suited to the Darling Downs and the cooler districts of the State.

Orchard Notes

NOVEMBER.

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard increasing temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress because of lack of moisture, trees should be irrigated thoroughly whenever water is available. At the same time attention should be given to cultivation, particularly on hillside orchards. In the coastal districts, the possibility of the approach of storms will prompt growers to consider the completion of each cultivation by forming shallow drains for running off excess water and preventing soil loss.

The incidence of mites, the direct cause of the darkening of the skin of the fruit, a condition known as ''Maori disease,'' is another matter for observation. Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from departmental publications on the subject. Every fruit and vegetable grower should have the Agricultural and Pastoral Handbook, Vol. III. (Insect Pests and their Control, Plant Diseases and their Control), obtainable from the Department of Agriculture and Stock. Price 3s., post free.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples to the acre, quicker, better, and healthier growth; and finally better fruit by liberal fertilizing through the leaf bases with 10-6-10. Collectively, these practices tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have brought about great improvements in pineapple culture, so they might be applied in principle to banana-growing. Smaller areas and large production per acre should cut overhead costs, lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end, select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as the weather permits and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture, and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for caterpillar plagues; watch for bunchy top.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, for if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth.

Spraying for codling moth should be continued, and all pip fruit trees should be bandaged by the beginning of the month; further, the bandages should be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is a cause of the increase in this serious pest in the Granite Belt, and growers are warned that they should pay more attention to the destruction of this pest if they wish to grow pip fruit profitably.

Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once. Unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action should be taken to combat this the most serious pest of the Granite Belt, and growers should realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry.

A sharp lookout should be kept for brown rot in fruit, and, on its first appearance in a district, all ripening fruit should be sprayed with lime sulphur 1 in 120.

All grape vines, potatoes, and tomatoes should be sprayed with Bordeaux or Burgundy mixture, as required, for the control of downy mildew and anthracnose of the grapes, and Irish blight and target spot of the potato and tomato.

RHODES GRASS AS HAY.

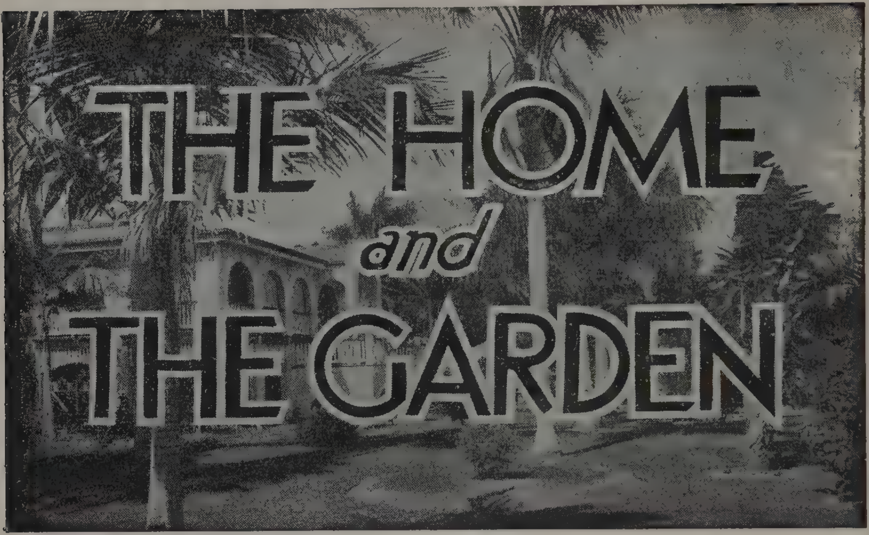
While the value of Rhodes grass as pasture is well recognised in Queensland, its usefulness as a hay crop is little appreciated. Not only could fodder reserves be built up on the farm or station by conserving surplus Rhodes grass pasturage as hay, but, in some circumstances, sowing down of special areas to Rhodes grass for hay would be sound agricultural practice.

The cutting of hay from grassed country will be restricted, necessarily, to cleared land with a fairly even surface, and is practicable only in seasons of abundant growth. When seasonal conditions are such that a surplus of grass is indicated at an early date, the paddocks which can be mown should be closed to all stock and permitted to develop to the hay stage, when the crop may be harvested. In normal seasons, if the cutting is made during summer, the grass will recover quickly.

Apart from lucerne, the main summer-grown hay crops (e.g., Sudan grass and millets) are annuals. Cropping with annuals has the very obvious disadvantages of high cost of production and of exposing soils to erosive influences, particularly storm waters. A perennial or long-lived hay grass costs little to maintain, prevents erosion, improves the texture of the soil, and adds materially to its organic content. Although it is not suggested that Sudan grass and millets should be abandoned as hay crops in favour of Rhodes grass, farmers and pastoralists might well give consideration to the testing of Rhodes grass for hay purposes.

Because of its susceptibility to injury by heavy frosts, Rhodes grass is, however, not likely to prove more useful than a rotation of annuals in the colder regions of the State, such as parts of the Darling Downs.

In the drier localities in which Rhodes grass is grown largely, the hay is easily cured. In most cases it should be in the stack within forty-eight hours of cutting. The yield varies, of course, with seasonal and soil conditions, but on fertile soils young stands should provide at least two cuttings a year, each of 1½ to 2 tons of hay to the acre. The quality of the hay, particularly its palatability, is somewhat variable, but all classes of stock will eat it without much waste.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

YOUR CHILD.

THE APPROACH OF SUMMER.

BABY enjoys the summer months when he becomes released from the burden of clothing which hampered his movements during the cold weather. There is nothing that pleases him more than to exercise his limbs freely in the most scanty attire or in no clothes at all.

Avoid Overclothing.

If baby is overclad in hot weather he will suffer from prickly heat. This is caused by excessive sweating and the sweat not being allowed to evaporate freely. The condition is aggravated by friction. As we mentioned in our article on baby's clothing, he should wear cool singlets, not heavy woollens. Outside the singlet he should wear, in hot weather, the lightest of airy garments, which should be removed when he is indoors. He should not be tormented with flannel binders. Prickly heat affects the back chiefly, because he lies on his back and the sweat cannot dry quickly. He should be allowed to sleep on a cool sheet placed on a firm mattress, and during the day he may lie and kick on a soft grass mat on the floor, provided he is out of a direct draught. He should be trained to sleep on his side.

Avoid Overfeeding.

Baby does not require as much food or as much fat in his food in the hot weather. The intervals between feeds should be lengthened to four hours if this has not already been done. He should be encouraged to drink cool boiled water between meals as he naturally gets thirsty in hot weather.

Danger of Diarrhoea—Mortality Reduced.

Before Baby Clinics were established in Queensland by the Government in 1918, many infants died as the result of diarrhœa. The epidemic began with the sudden onset of hot weather, which usually occurred in October when flies became prevalent.

Although deaths due to diarrhœa have been reduced to about one-tenth of what they were as the result of mothers learning how to guard against it, our efforts to prevent it should not be relaxed.

It is well to remember that a breast-fed infant has soft motions. They are scarcely ever firm and solid like those of an artificially fed infant. A healthy breast-fed baby may have two or three motions daily, perhaps one larger than the others. When an artificially fed infant has several loose motions or motions which are green or pale a mother should be on her guard. An underfed infant may pass small fluid motions because he is not having sufficient food to give the motions substance.

Diarrhoea from Unsuitable Food or Feeding.

There is a form of diarrhœa which is brought about by overfeeding or by giving unsuitable food. The loose motions represent nature's effort to expell the undigested surplus or harmful material. If the overfeeding continues, an upset may occur, the child refuses his food and loss of weight follows.

Diarrhoea Due to Infection.

Diarrhœa due to infection by germs is more serious. The germs responsible for the infection are present in the motions of children suffering from the disease and are conveyed to the food on the hands of the attendants or by flies, or by other means. Most breast-fed infants escape the infectious form of diarrhœa, because their food is germ-free. Occasionally one becomes infected by using a contaminated dummy or by accidentally swallowing some infected material.

In this connection it is interesting to note that calves, like babies, suffer from ''scouring'' in warm weather, while the young of horses, pigs, and dogs remain free. Calves are liable to suffer because man takes the cow's milk for himself and feeds the calf out of a bucket. The baby is liable to suffer when he is denied his mother's milk.

Encourage Natural Feeding.

For this reason every effort should be made to give baby his natural food, both what he is able to take himself and what can be expressed by his mother. In cases where the mother's supply is short she should do what she can to increase it. She should drink as much water as possible; she should take 1½ to 2 pints of milk each day; she should try to make time for more rest both physical and mental; she should feed baby regularly, making sure that at least one breast is emptied at each feeding, and she should express milk from both breasts after each feeding. If her supply continues to be short, and she is not already receiving help at a Child Welfare Centre, she should seek the advice and help of a child welfare nurse, either personally or by letter, who will teach her the methods of breast stimulation. In most cases the supply can be increased by these means.

Complementary Feeding.

In cases in which the mother's milk is not sufficient for the baby's requirements, some form of artificial milk mixture will need to be added.

If a refrigerator is available and reliable pasteurised milk is received in sealed bottles, these should be placed in the refrigerator as soon as possible. If a refrigerator is not available this milk should be placed on the ice or in an improvised cooler such as that illustrated in the book entitled ''Care of Mother and Child,'' issued at the Child Welfare Centres throughout the State.

All other milk should be brought to the boil as soon as possible after it is received, cooled as quickly as possible and kept cool, below 60 degrees if possible, because germs multiply most rapidly at about blood heat—98 degrees Fahr.

If no other convenience is available the milk should be poured into an upright jug standing in cold water and placed in the coolest, shadiest, and most draughty part of the house. The jug should be loosely covered with damp butter muslin which is allowed to dip into the water all round.

PREVENTION.

The Care of Milk.

Once it is decided to introduce cow's milk into a child's feeding, the greatest care must be exercised in securing the freshest and cleanest milk, particularly when the weather is hot. The hotter the weather the more readily germs multiply. All bottles, jugs, saucepans, teats, &c., must be washed absolutely free of all traces of milk immediately after they are used. An almost invisible amount of stale milk may render the whole day's supply dangerous. Wash all utensils in cold water before using hot water and soap. Keep everything that is used in connection with baby's food covered from flies. Milk may become contaminated and poisonous after being pasteurised or boiled, although it may not be sour. If a change in the quantity or composition of the milk mixture becomes necessary during the hot weather, make the change gradually.

Dried Milk.

If reliable clean fresh milk cannot be obtained, dried milk should be used. Dried milk is also very useful during long journeys.

Care of Napkins and Hands.

Remove soiled napkins to a covered pail at once and wash the hands carefully before handling baby's food.

Treatment of Diarrhoea.

In some cases the motions are observed to be pale or green and the child ''off colour'' before the motions became frequent. This is the time when treatment should begin. The following treatment is recommended:—

1. Give a dose of castor oil—one teaspoon or more according to age.

The practice of giving castor oil to babies who are well is condemned, but when it is given in cases of diarrhœa it is found to hasten recovery.

2. Stop milk and all other food and give boiled water only.

Diarrhœa in a breast-fed infant is not likely to be as serious as in an artificially-fed infant. When it does occur the omission of several feeds and the substitution of boiled water may be all that is necessary. During this time the mother should express the milk from her breasts at the usual feeding times. When the child is put back on the breast, he should be given short feeds at first and boiled water given before and after until it becomes evident from the character of the motions and the improvement in the child's general condition that he is able to deal with his food. The time of each feeding is gradually lengthened until his usual feeds are resumed. This may take some days.

3. In the case of an artificially-fed baby proceed as above, giving as much boiled water as baby will take. After the omission of one or two feeds, in addition to the water give barley water sweetened with glucose every two or three hours. Continue this treatment until the motions lose their unhealthy appearance and the child's general condition has improved. Crying and irritability during the course of the disease are favourable signs, whereas drowsiness and limpness are unfavourable.

Relapses are often brought about by giving milk too soon, therefore do not be in a hurry to give milk. A dextrinised food made with water is very useful and can be used in conjunction with the barley water. Dried apple powder made into a mixture with water is often very useful.

In the case of older children cereal jellies, strained vegetable broth, vegetable puree, and rusks are gradually added before any milk is given. Begin adding milk—small quantities, even one teaspoon—to the barley water and other mixtures which the child is taking, and gradually increase according to his tolerance, which is decided by the appearance of the motions and by the child's general condition. The child may have an intolerance for fat for a time subsequent to an attack, and it will be advisable to add such things as cream, cod liver oil, and butter very gradually.

In cases in which definite signs of improvement have not occurred within twenty-four hours after commencing this treatment, medical advice should be sought.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N.1, Brisbane.

BEAUTY AND GOOD TEETH.

"All facial beauty depends basically on the harmony of a well-developed bony structure, and the bones of the face must be well-shaped to achieve a pleasing result. These include the bones of the cheeks, nose, and jaws; no other part of the face so influences the whole. An over-developed or an under-developed jaw entirely alters the expression of the face, and we hear the owners of such features described as 'pugnacious' or, alternatively, as 'weak-chinned.'"

It is truly amazing the extent to which the lower third of the face, including the jaws, lips, and, of course, teeth, is responsible for its expression. The most homely face can be transformed by a smile revealing even white teeth, while on the contrary the most perfect features will lose their attraction if on smiling they reveal dirty, uneven, or missing teeth.

The harmonious effect of well-developed bones is not unattainable. Practically all are born with correctly formed and proportioned jaws, and given the proper conditions for growth will develop as they should. Unfortunately, incorrect breathing, lack of sufficient exercise, and bad habits, such as sucking a dummy or a finger, which retard development, are so common that few of us reached adult age looking as we might have done.

The teeth themselves form a very vital part of this bony framework; their disarrangement might cause many and varied results, as "buck teeth" when the lips cannot cover them and their loss is always attended by the collapse of the lips and cheeks. Even the loss of back teeth, which the individual often hopes will pass unnoticed, cause the cheeks to fall in, giving an older and sometimes even a haggard expression.

Crooked teeth may be straightened and lost teeth may be replaced, and the earlier the better. But, better still, teeth and jaws may be looked after in such a way that neither of these calamities occur. Good teeth are not only an asset to looks and personality, but to health itself, without which, of course, we can be sure of neither.

School children are noticed frequently sitting with their chin leaning on the hand. If this habit is continued, the jaw will grow sideways. Biting in one position was bad, and breathing through the mouth must not be permitted. Teeth should be cleaned after every meal. From about three years of age the child should be taken regularly to the dentist. It is much cheaper to have a tiny hole filled than a large one. Children should be taught to regard the dentist as a friend.—Mrs. J. K. Savage, B.D.S., Director of Dental Health Education for the Australian Dental Assn., N.S.W. Branch.

◆

IN THE FARM KITCHEN.

FOR A CHANGE IN THE MENU.

Stuffed Cabbage.

Divide a well-washed cabbage into single leaves and boil in salted water until limp, but not cooked. Drain well and fill with the following mixture:—Fry a minced large onion until cooked, but not brown; add 1 large diced raw potato and 1 small green diced capsicum. Cook a little longer, then add 2 cups cooked diced meat (left-overs), 1 teaspoon chopped parsley, pepper, salt, and a little nutmeg. Cook gently for about ten minutes, then add enough tomato sauce to bind mixture together. When all leaves have been filled, roll up tightly and place them in a greased casserole dish, pour over 1 tablespoon butter, ¼ cup cream, and ½ cup milk, mixed together. Cover well and bake in a moderate oven for one hour. When ready to serve, sprinkle with 2 tablespoons finely-chopped and fried red capsicum and 1 dessertspoon chopped parsley.

Onion Farcies.

Wash onions well, but do not peel them. Simmer in boiling salted water for half hour, drain well, remove the outer skins, and then carefully remove centre, leaving only a wall about ½ inch thick. Chop the centres and fry in a little butter until cooked, but not brown. Mix cooked onion with 1½ cups cooked rice, 1 teaspoon chopped parsley, pepper and salt to taste, ¼ cup each chopped almonds and walnuts, 1 dessertspoon chopped and cooked green capsicum, and 1 beaten egg. Fill prepared onion cases, place in greased casserole dish, cover and bake in a moderate oven for about forty-five minutes.

Savoury Girdle Cakes.

Beat 2 egg-yolks with 1½ cups milk, 1 teaspoon salt, and pepper to taste. Gradually beat in 1¼ cups sifted flour, then 1 dessertspoon melted butter. Now add 1½ cups grated potato, 1 tablespoon shredded and fried bacon, and 1 teaspoon chopped parsley. Beat the whites until stiff and fold into batter. Bake at once on a hot griddle and serve at once.

Rhubarb Pie.

Line a tart plate with a good short crust and reserve enough to cover top. Mix together 1 bunch rhubarb cut into 1-inch pieces, 1 cup each seeded raisins and sugar, and 1 tablespoon sago. Add ¼ cup water and mix well together so the sago will not be in one place. Fill prepared tart case, cover with lid. Make a hole in it for steam to escape, and bake in hot oven for about forty-five minutes.

Fish Pudding.

Boil 1 lb. fish and 1 lb. haddock in salted water until tender, but not broken. Drain well and flake. In the meantime, cook 1 cup rice in 2 cups water and 2 cups milk and salt to taste, until quite tender, but not sticky. Drain well and place a layer in the bottom of a fireproof dish. Now add a layer of prepared fish, season with pepper, salt, and a little grated lemon rind, and a few dots of butter, continue with alternate layers of fish and rice until dish is almost full. Beat 3 eggs slightly, add 2 or 3 cups milk, pepper and salt to taste, and pour over contents. Bake in a moderate oven until set and nicely browned.

Mocha Bread Custard.

Have some thin slices of brown bread and butter free from crust. Place a layer in the bottom of a fireproof dish, sprinkle with brown sugar, then another layer of bread. Now add a little more sugar, 1 tablespoon chopped candied peel, then another layer of bread. Now spread with a layer of whipped cream (about ¼ cup), then another layer of bread. Beat 3 eggs slightly, add 2 cups milk, 1 cup strong black coffee, pinch salt, 1 dessertspoon sugar. Pour over prepared bread, and place in a dish of water. Bake in a moderate oven until set and nicely browned.

Vegetable Salad.

Mix together 3 cups cooked peas, 2 teaspoons finely-chopped onion, 1½ cups finely-chopped raw celery, pepper and salt to taste, ½ cup chopped capsicum, red or green, 4 cups finely-shredded white cabbage, 2 grated raw carrots, 4 or 5 sliced radishes. Mix 1 packet cream cheese with 1 cup French dressing, add to prepared vegetables, mix well together, and lastly add 1 small lettuce broken into pieces.

Grilled Ham with Cornmeal Cakes.

Place 2½ cups boiling water in the top of a double pan, gradually add 1 cup cornmeal and ½ level teaspoon salt. Stir well over the fire until it thickens, then cook for one hour. Well grease a medium-size making-powder tin, or any other cylindrical tin will do, fill with mixture and allow to become quite cold. Cut into slices about ½ inch thick, dip in beaten egg, flavoured with pepper and salt. Fry in boiling fat until a golden brown. Fry as many slices of tinned pineapple as required in a little butter until a nice brown. Place a fried cake on a slice of pineapple, then garnish with slices of grilled or fried ham.

Sausage and Cabbage Hot Pot.

Boil some cabbage, or, if you prefer it, cook it in the following manner:—Shred up the cabbage finely in strips, removing any hard parts, and put these into cold water as you do them. Put a little butter in a saucepan, and when it is melted take the cabbage strips out of the water in handfuls just as they are and put them into the pan. Do not add any more water than that which adheres to the strips, but dust in some salt and pepper, put on the lid and cook for about an hour, stirring the cabbage now and then to bring the cooked parts up to the top. Butter a hot pot and put into it alternate layers of cabbage, lightly fried onion, and parboiled sliced potatoes. Season as you go, and embed here and there as many chipolata sausages as you think fit, skinning them if you think it necessary (or larger sausages in small pieces may be used equally well). See that the top layer is of potatoes, put on the lid, and bake in a moderate oven for three-quarters of an hour. Then take off the cover and let the potatoes on the top brown quickly before serving.

Frankfurts en Brochette with Red Cabbage.

Drop 6 frankfurts in boiling water for a few minutes, then remove skin and cut in three slices lengthwise. Cut some cheddar cheese into slices the same length as the frankfurts, but not as thick, and sprinkle with lemon juice and a little cayenne. Place a slice of frankfurt on a skewer, a slice of cheese, a slice of frankfurt, a slice of cheese, and another slice of frankfurt. Place under a hot griller and cook until cheese is melted a little and brown. Turn during the cooking. Dish up on the skewers around red cabbage cooked as follows:—Shred a small red cabbage and soak for one hour. Drain well and place in a saucepan with 1 tablespoon melted butter, pepper and salt to taste. Cover with tight-fitting lid and cook over a low gas until tender, stirring it now and again. It will take about 20 minutes.

Baked Fillet of Pork.

Place about 2 lb. slice of pork (from the leg, and cut about 2 inches thick) in a well-greased casserole dish. Cook 2 or 3 apples with as little water as possible and rub through a sieve. Add the juice of 1 orange, 2 tablespoons lemon juice, 2 level tablespoons each brown sugar and melted butter, ¼ teaspoon ground cinnamon (optional). Cover pork with mixture and bake in a moderate oven for about one and a-half to two hours.

Meat Loaf.

Mix together 4 cups cooked and minced cold meat, 3 cups stock, 1 cup water, 3 cups fine white breadcrumbs, 2 medium-minced onions, 2 level teaspoons salt, 1 teaspoon chopped parsley, pepper and a little grated horseradish to taste. Beat 3 eggs and bind mixture. Press into a well-creased oblong loaf tin and bake in a moderate oven for 1 hour or until it feels firm. Turn out and serve with a sauce made from the left-over gravy, adding 6 chopped mushrooms, 1 chopped hard-boiled egg, 1 teaspoon Worcestershire sauce, and seasoning with pepper and salt. Simmer until mushrooms are cooked and serve separately.

Ham Rolls.

Have as many thin slices of ham as required, allowing two per person. Spread each slice with made mustard. Chop 2 hard-boiled eggs finely, add 1 teaspoon made mustard, pepper and salt, 1 teaspoon each butter, chopped sour gherkins, and chopped chutney. Spread this on ham, roll up and fasten with a toothpick. Place on a greased tray and spread with a little butter. Grill quickly and serve.

Honey and Walnut Rolls.

Dissolve together 1 level cup each sugar and butter and boiling water, 1½ level teaspoons salt, and 2 well-beaten eggs. Place 2 oz. compressed yeast in 1 cup cold water, allow to stand for 5 minutes, then stir until dissolved. Add to butter mixture, which should be lukewarm. Now add 6 cups sifted plain flour, knead until quite smooth, cover with a cloth, and set aside in a warm place until it has doubled its bulk. Form into rolls and place on a greased baking tin, in which there is about ½ inch honey, and sprinkle well with chopped walnuts. Allow to rise until they have again doubled their bulk, then bake in a hot oven for about twelve to fifteen minutes. Dip brush in honey surrounding rolls and brush over top. Return to oven for a few mintues and serve hot with butter.

Steamed Raspberry Pudding.

Cream 4 oz. butter and gradually add 4 oz. castor sugar; add 2 eggs, one at a time, then add 7 oz. self-raising flour, sifted together with a good pinch salt. Add the grated rind of 1 lemon, the strained juice, 4 dessertspoons raspberry jam, and a little cochineal to colour slightly. Mix well and add a little milk if too dry. Steam for two hours and serve with a custard sauce.

Grilled Butter Fish with Mustard Sauce.

Prepare fish and wipe dry. Cut down the back and remove bone. Put the fish flat on a well-greased dish, sprinkle with salt and pepper and dot with butter. Grill slowly for a few minutes, then spread with the following sauce:—Melt 1 dessertspoon butter in saucepan, add 1 dessertspoon flour, 1 teaspoon dry mustard; cook a little, then add ¼ pint milk. Stir until thick, then add salt, pepper, and 1 dessertspoon vinegar and a pinch ground ginger. Pour or spread over fish and finish grilling.

Grilled Kidneys and Bacon.

Prepare kidneys in the usual way, then place a skewer through the two halves in order to keep them flat. Place them on a tin with bacon rashers and cook until tender, taking care to turn them often. Sprinkle with pepper and salt and serve.

Banana and Strawberry Meringue.

Make a meringue case with 4 egg-whites and 8 oz. castor sugar. When cooked and quite cold fill with the following:—Mash 3 ripe bananas, add ¼ teaspoon lemon rind, a little lemon juice, and ½ pint cream, and about 2 oz. castor sugar. Whip until stiff, then add 1 box sliced strawberries, keeping a few back to decorate top. Fill meringue, decorate top, and when just about to serve sprinkle with icing sugar.

CITRUS PRESERVES.

Orange Syrup.

An exceptionally fine beverage which may be kept quite a while may be made from any sound oranges as follows:—

Dissolve 3 lb. sugar in 1 quart of water and bring to the boil. Then add ½ oz. Epsom salts and boil fifteen minutes before adding 1 oz. tartaric acid and ½ oz. citric acid. The grated peel and the juice of six average-sized oranges and of two lemons are then added. Allow the mixture to cool, then strain through cheesecloth; bottle and securely seal with paraffin or sealing wax.

When desired for use, dilute with water according to palate.

Orange, Grapefruit and Lemon Marmalade.

Finely shred one orange, one grapefruit, and one lemon, all of average size. Add 5 pints of water (boiling) and allow to stand overnight; then boil until tender and let stand a further twenty-four hours. The following morning add 6 lb. of sugar and boil briskly until it jells—about one and a-half hours.

Orange and Apple Jam.

Slice three average-sized oranges and add 6 pints of boiling water; allow to stand overnight. Add three finely-sliced apples (Granny Smith for preference) and boil for half an hour, or until tender. Then add 6 lb. of sugar and boil the whole briskly for up to two hours, when it should jell if tested.

As with other orange recipes, the use of freshly picked fruit is advised, but if picked for some time, or if uncertain, add the juice of two lemons to prevent crystallisation or candying of the jam.

Sweet Orange Jam.

Allow 2 pints of boiling water to each lb. of finely-sliced oranges and let stand overnight. The following morning boil for half an hour to soften and let stand a further twenty-four hours. This is important, having a decided effect upon the jelling quality. Measure the pulp, and to each pint allow 1 lb. of sugar. Boil briskly until the jam becomes clear and sets well when tested—it generally takes about one and a-half hours of brisk boiling.

The juice of two lemons may be added with the sugar to improve the flavour, and, if the fruit has been picked some time, to prevent crystallisation.

Orange Jelly.

Cover six sliced oranges and two lemons with 4 quarts of boiling water. Allow to stand overnight, and then boil briskly for about half an hour, or until tender. Allow to stand a further twenty-four hours, then bring to the boil, and, after straining through cheesecloth, filter through flannel. Avoid any squeezing of the pulp, since this results in clouding. Measure the juice, and to each pint allow 1 lb. of sugar; boil briskly until it jells when tested.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of August in the Agricultural Districts, together with Total Rainfall during 1940 and 1939, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1940.	Aug., 1939.
North Coast.	In.		In.	In.
Atherton	0·87	39	0·64	0·19
Cairns	1·69	58	0·61	0·52
Cardwell	1·25	68	0·38	0·90
Cooktown ..	1·17	64	1·16	0·23
Herberton ..	0·62	54	0·30	0·16
Ingham	1·43	48	1·86	1·27
Innisfail	4·92	59	3·52	0·73
Mossman Mill ..	1·26	27	0·35	0·68
Townsville ..	0·60	23	2·12	0·54
Central Coast.				
Ayr	0·53	53	3·65	0·35
Bowen	0·62	69	7·84	0·63
Charters Towers ..	0·50	58	1·44	0·53
Mackay P.O. ..	1·00	69	7·09	1·04
Mackay Sugar Experiment Station	0·84	43	6·76	0·94
Proserpine ..	1·35	37	6·68	0·31
St. Lawrence ..	0·78	69	2·81	1·02
South Coast.				
Biggenden ..	1·10	41	0·29	1·55
Bundaberg ..	1·31	57	0·93	3·56
Brisbane	1·95	88	0·40	2·29
Caboolture ..	1·51	53	1·24	2·21
Childers	1·26	45	0·79	3·43
Crohamhurst ..	2·17	47	4·01	2·52
Esk	1·43	53	0·24	1·29
South Coast—contd.	In.		In.	In.
Gatton College ..	1·10	41	0·21	1·56
Gayndah	1·16	69	0·06	1·68
Gympie	1·70	70	0·76	1·85
Kilkivan	1·40	61	0·25	1·80
Maryborough ..	1·65	69	1·24	1·39
Nambour	1·89	44	3·35	3·36
Nanango	1·31	58	0·41	1·67
Rockhampton ..	0·82	69	2·17	1·18
Woodford ..	1·64	53	1·26	2·25
Central Highlands.				
Clermont ..	0·68	69	2·92	1·17
Gindie	0·63	41	..	0·83
Springsure ..	1·01	71	1·62	1·07
Darling Downs.				
Dalby	1·19	70	0·04	1·14
Emu Vale ..	1·11	44	0·10	1·77
Hermitage ..	1·15	33	..	..
Jimbour	1·13	52	..	0·74
Miles	1·13	55	..	1·05
Stanthorpe ..	1·79	67	0·13	2·18
Toowoomba ..	1·62	68	0·43	1·73
Warwick	1·45	75	0·07	1·44
Maranoa.				
Bungeworgorai ..	0·70	26	0·08	0·80
Roma	0·89	66	0·09	1·08

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1940.

Compiled from Telegraphic Reports.

Divisions and Stations.	Mean Atmospheric Pressure. at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·04	78	67	83	10	59	23, 25	116	10
Herberton	..	69	51	76	26	42	16	30	5
Rockhampton	30·16	77	56	85	27	49	5, 6, 7, 17	217	4
Brisbane	30·22	72	51	83	13	46	8	40	6
Darling Downs.									
Dalby	30·22	72	41	82	27	28	7	4	1
Stanthorpe	..	65	34	73	26	21	7, 16	13	4
Toowoomba	..	65	45	75	27	36	16	43	5
Mid-Interior.									
Georgetown	30·06	84	56	89	26	46	5	1	1
Longreach	30·15	78	47	85	13	36	16	51	2
Mitchell	30·22	71	39	81	26	26	8	51	2
Western.									
Burketown	30·06	85	58	91	27	50	22	..	..
Boulia	30·15	78	51	87	26	43	4, 5, 7	..	..
Thargomindah ..	30·21	72	45	86	26	35	8	9	1

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by A. C. Eglinton.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

					MOONRISE.	
	October, 1940.		November, 1940.		Oct., 1940.	Nov., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·32	5·52	5·0	6·11	5·2	6·0
2	5·31	5·52	..	6·11	5·48	6·53
3	5·30	5·53	..	6·13	6·35	7·49
4	5·29	5·53	4·59	6·14	7·24	8·46
5	5·28	5·54	4·59	6·14	8·15	9·43
6	5·27	5·55	4·58	6·14	9·8	10·40
7	5·25	5·56	4·57	6·15	10·3	11·34
						p.m.
8	5·24	5·56	4·56	6·15	10.58	12·27
9	5·24	5·57	4·55	6·16	11.53	1·19
					p.m.	
10	5·23	5·58	4.55	6·17	12·47	2·10
11	5·22	5·58	4·55	6·18	1·40	3·0
12	5·20	5·58	4 54	6·19	2·32	3·51
13	5·18	5·59	4·53	6·19	3·23	4·42
14	5·17	6·0	4·53	6·20	4·14	5·33
15	5·16	6·0	4·52	6·21	5·5	6·26
16	5·15	6·1	4·52	6·22	5·55	7·18
17	5·14	6·1	4·52	6·23	6·47	8·10
18	5·13	6·2	4·51	6·24	7·38	9·1
19	5·12	6·3	4·51	6·25	8·30	9·50
20	5·10	6·3	4·51	6·25	9·22	10·37
21	5·10	6·4	4·50	6·26	10·14	11·21
22	5·9	6·4	4·50	6·27	11·3	..
						a m.
23	5·8	6·5	4·50	6·28	11·51	12·4
24	5·8	6·6	4·50	6·28	..	12·47
					a.m.	
25	5·7	6·6	4·49	6·29	12·38	1.28
26	5·6	6·7	4·49	6·29	1·23	2·11
27	5·5	6·8	4·49	6·30	2·7	2·57
28	5·4	6·8	4·49	6·31	2·52	3.45
29	5·3	6·9	4·49	6·32	3·36	4.36
30	5·2	6·9	4·48	6·33	4·20	5·31
31	5·1	6·10			5.8	

Phases of the Moon, Occultations, &c.

1st Oct.	●	New Moon	10 41 p.m.
8th „	☽	First Quarter	4 18 p.m.
16th „	○	Full Moon	6 15 a.m.
24th „	☾	Last Quarter	4 4 p.m.

Perigee, 2nd October, 2.0 a.m.
Apogee, 15th October, 8.0 p.m.

On the first of this month a total eclipse of the sun will occur, but it will not be seen in Australia. We must wait until 1999 before we see a total solar eclipse. The eclipse of 1st October will be seen along a track about 120 miles wide across the north of South America, the South Atlantic, and South Africa. There will be a partial eclipse, growing progressively smaller from the central line over the greater part of South America, and south from Equatorial Africa.

Venus is still the Morning Star. She reached her greatest altitude last month and is now descending toward the farther side of the sun. There were reports of Venus being seen in full daylight last month, but the planet is now getting too near the sun to be visible while Old Sol is above the horizon. Regulus, the bright star in the handle of the Sickle in Leo, may be seen near Venus on the mornings of 6th and 7th October. Although appearing small when compared with Venus, Regulus is a very large and tremendously hot sun, seventy times more luminous than our sun. Its light has taken fifty-six years to reach us, while the light from Venus, at present, takes but a little more than seven minutes.

An interesting feature of the evening is a phase of the rare phenomenon of the triple conjunction of Jupiter and Saturn, mention of which was made in August. On 12th October the second conjunction takes place, when Jupiter will pass a little north of Saturn. The planets rise about quarter to eight on 12th October.

In the second half of this month we should see Mercury, the little world which is the nearest to the sun and is heated by the solar rays seven times hotter than the earth. Mercury, however, does not rotate like the earth but keeps one hemisphere always toward the sun, while in the other eternal night reigns. On 20th October, Mercury will be 24 degrees east of the sun and will not set until nearly 8 o'clock. It will appear as a bright, sparkling star, a little below the head of the Scorpion, which is going down head first with its starry, curved tail entangled in the Milky Way. We sometimes see Mercury clearly but, it is said, Copernicus, the father of modern astronomy, never saw the planet, probably because of its low altitude in Poland, his native country.

7th Nov.	☽	First Quarter	7 8 a.m.
15th „	○	Full Moon	12 23 p.m.
23rd „	☾	Last Quarter	2 36 a.m.
29th „	●	New Moon	6 42 p.m.

Perigee, 27th November, at 10.0 p.m.
Apogee, 12th November, at 2.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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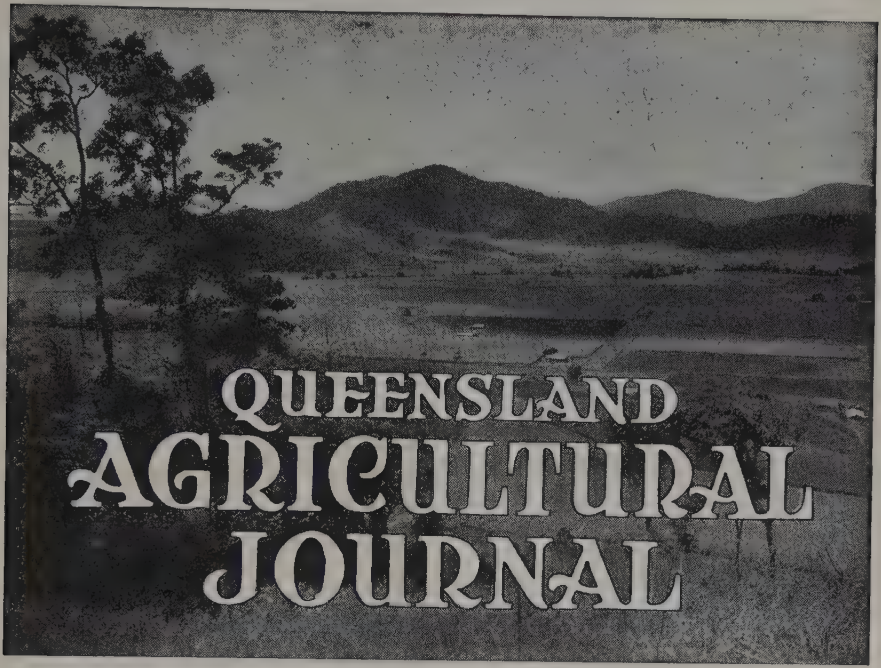
ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Britain's Great Agricultural War Effort.

THE British farmer is patriotic in the best sense and so now, in the second year of the war, he is right on top of his job of food production. Evidence of that is the 2,000,000 extra acres ploughed up last year, and the plan for ploughing up another 2,000,000 acres of grassland this year. Furthermore, he has altered his entire system of farming, where necessary, to suit the changed conditions brought about by the war. Food stocks are now more abundant than in the days of peace. The British Ministry of Agriculture has stated that the first war-time harvest has made a substantial addition to the food supplies of the nation. More cereal, root and fodder crops have been grown, and this increase in arable acreage has not been obtained at the expense of Britain's flocks and herds. Dairy cows and other cattle have, in fact, increased, and sheep numbers have been maintained. Pig and poultry numbers have been reduced, but the reduction is less than was anticipated. Far from allowing the "cataract of calamity" which burst over Europe in the summer to depress him, the British farmer is finding that the uses of adversity are abundant.

What will interest the producers of Australia, as well as the producers of other Dominions, is that agricultural products valued at over £77 millions are no longer reaching Britain from continental Europe. Included in that total are several items of interest to Queensland producers particularly. From countries now in enemy occupation, Britain imported annually nearly £23 millions worth of pig and poultry products and over £34 millions worth of butter and cheese. Supplies of these commodities have to be made up from other sources, and this broadened market may be regarded as something in the nature of a German gift to the producers of the Homeland and the Dominions.

The British Government has expressed a determination that agriculture shall not a second time be allowed to collapse after the present war like it was after the last war. That determination is based on the conviction held by the Government that a prosperous agriculture is just as important to Britain—as it is to Australia—as a prosperous secondary industry.

Incidentally, the idea is spreading in the Old Country that while the hazards of war are around its shores, no amount of cash or credit can guarantee an uninterrupted food supply for both the people and the farm animals. Ensilage of suitable crops is, therefore, regarded as riches banked against any misfortune and, further, every silo filled helps "to cheat the torpedo of a target."

In this war, farmers of the British Commonwealth are shouldering a heavy responsibility. The nation has to be fed and they are doing the feeding. In a truly literal sense, then, British farmers are ploughing for victory.

Queensland Bacon on the British Breakfast Table.

IT is said that people in the Old Country are now eating Australian bacon because they have no choice. That may be so, but, it is confidently believed that by our continuing to improve the quality of pig products in every respect the people of Britain will, when present trade restrictions are removed, eat Australian bacon because they prefer it.

Because of the war, Australia has now an expanding market at good prices for frozen pig carcases at baconer weights. The present, therefore, is a favourable time to plan for an extension of our export pork industry on an efficient and sound basis. The market requirements are known. Suitable stock and abundant feed are available or can be conserved on our farms, and necessary improvement in the quality of our pig products can be made. Of course, it is obvious that no single type of pig will suit all the weight classes required by the porker and baconer markets. Although the needs of both have been met by various breeds, Berkshires (in general) and Middle Whites are typically pork, and Tamworths and Large Whites are typically bacon pigs.

Until recently, the pig was regarded as a means of converting the by-products of the dairy industry into ready money. Now, however, pig husbandry is rapidly becoming a major industry, and cereals, plus animal and vegetable protein-rich concentrates, are used in feeding pigs, bringing about a remarkable development in the industry, especially in relation to our export frozen pork and bacon trade.

Fat Lamb Quality.

THE findings of the Commonwealth Committee on Animal Production contain some useful information for sheep men, and which is of especial interest to fat lamb raisers on the Darling Downs. The cutting out of discriminating competition on the British market might have the effect of inducing a few short-sighted producers to relax their efforts to maintain and improve export quality, but it needs very little thought to realise how disastrous that would be to the whole fat lamb industry. The competition after the war may be even more intense than it was before the war, and it is easier and cheaper to maintain quality and purity of breed—especially in respect of pure-bred sires—than to have to build up again under what will probably be far less favourable marketing conditions. The suggestions of the Committee on the technical side are worthy of earnest study in the light of the varying conditions in different districts, and the need for pasture improvement and the growing of suitable fodder crops when changing from wool producing to fat lamb raising should not be overlooked. The use of suitable ewes and the careful selection and rearing of sires are other sides of the industry which demand more thought in relation to the factors of district and climate than they usually receive. Sheep men generally should, it is suggested, give consideration to the report of the Committee, which is now in circulation. In that way they will be doing a valuable service to the Commonwealth as well as to themselves, insofar as it leads to efficiency in management and in everything else that will improve still further the quality of their production.

Planning for Post-war Production.

IF the development of Empire resources is a vital responsibility during the war, it will be an equally urgent responsibility when the war is over. When peace is restored the world will be faced with very serious problems of adjustment and readjustment. If the last war taught anything, it was that the pressure of war demands and the artificial values placed on the raw materials of war leave a bitter aftermath in the dislocations and readjustments which accompany the reversion of conditions to peaceful trade. The first becomes last and the last first. What is of primary importance during a war in quantity or quality or both, drops back into secondary importance. On the other hand, the demands of peaceful trade show shortages which have to be be made up. That means increased production, and, in turn, over-production. When the present war started, we were only beginning to appreciate conditions in which the primary producer was winning slowly back to the stage of profitable production after the last upheaval. Now we are in another war, it is plain that we shall have to look and plan well ahead for future development. The success of these plans will depend upon the use we make of scientific methods. All economic development, if it is to succeed, must take careful account of the natural conditions of production, processing, transport, and marketing.

Britain as well as Australia is thinking out a national plan of action to safeguard agriculture as soon as the war is over.

A long-term policy is essential, and it is suggested that all the ingenuity and resourcefulness of our statesmen will be needed to keep the ship on an even keel through the first critical post-war years. A stable agriculture should prove a powerful balancing factor in the national economy.

In Britain particularly, concern is felt for the future of agriculture. The possibility that all the world will be knocking at Britain's door begging her to buy cheap food is under serious consideration. If entry of imports is unregulated, it is believed that British agriculture would soon be swamped. That is the British viewpoint, and it serves as an indicator for our own producers of export commodities. There is a moral to be drawn from it too, and that is that quality—and quality of the highest attainable grade—must be the continuous watchword of Queensland producers if we are to maintain our hold on British markets when Europe returns to sanity.

The Thinning and Cultivation of Cotton.

THE thinning and cultivating operations are very important features of cotton-growing and every cotton-grower should, therefore, give careful attention to each detail connected with them. Each season a considerable number of farmers experience in some degree a reduction in crop yields through failure to practise the most suitable methods of thinning and cultivating their cotton crops. These notes have, therefore, been prepared to bring to the attention of cotton-growers important aspects of thinning and cultivating the cotton crop.

Thinning.

There is a decided tendency for many growers in Queensland to refrain from thinning their cotton crop, particularly where a grower has sufficient acreage to necessitate the employment of much labour. Experiments carried out by the Department of Agriculture and Stock at the Biloela Research Station and in co-operation with a number of farmers have definitely proved over a series of years, however, that the cotton crop should be thinned, and, if the thinning is done properly, that profitable returns generally result from carrying out this operation.

Unthinned plants tend to be more sensitive to climatic conditions. In wet seasons, particularly if on soils of a fertile nature with a high nitrate content, unthinned plants generally grow tall and spindly, which prevents the normal formation of the bottom bolls through the suppression of the lower fruiting branches. Under such circumstances the main crop of bolls usually forms late, and is thus subjected to the sucking insects that occur generally in greater numbers during the latter part of the season. The lint produced under such conditions is frequently of a wasty, weak nature, with a large amount of stains and yellow spots. In dry seasons, or in seasons experiencing favourable growing conditions until the plants are well laden, and then a severe dry period of marked duration develops, the competition for moisture and plant food soon becomes acute amongst unthinned plants during the stress period. This results first in serious shedding of the top and middle crops of flower buds and small bolls, and finally affects the development of the remaining bolls, which frequently open prematurely. Such restriction of boll development generally lowers the quality of the cotton contained in them, the fibres usually being short, weak, and of a wasty type.

Suitable Plant Spacings.

The fact that soils and climatic conditions and the habit of growth of the variety exercise a determining influence on plant development makes it advisable for each grower to carry out tests over a series of years to ascertain the most suitable spacing for his conditions. It appears, however, that spacings of 20 to 24 inches are necessary for normal plantings on the harder, less fertile clay loams and loams of the forest slopes, particularly in the drier districts, where the drought-resistant, more vigorous growing varieties, such as Lone Star and Mebane, are required. In late plantings of these varieties, fewer bolls per plant are likely to develop, hence a spacing of approximately 18 inches is advisable, as the extra number of plants may compensate for the lighter production per plant.

The results which have been obtained in spacing trials conducted in the Indio Acala and Miller varieties on alluvial loams and clay loams, indicate that plant spacings of 12 to 15 inches in these varieties can be relied upon to produce satisfactory yields of cotton of good quality. Farmers who have tried such spacings in these and the Half and Half and New Boykin varieties have realised satisfactory results. On the very fertile alluvial soils of the abovementioned types in the southern district, wider distances appear to be beneficial, however, and the general practice is to space the plants 20 to 24 inches apart. These spacings are also advisable for the wetter coastal areas. No greater distances than 24 inches appear to be necessary for satisfactory plant development in the main cotton-growing districts.

Height of Thinning.

The results of height of thinning experiments indicate clearly that a suitable stage at which to thin the crop is when the plants are from 4 to 8 inches high, as this prevents the plants from growing tall and spindly, and also reduces competition for moisture and plant food. If the field has been cultivated and cross-harrowed to eliminate early weed growth, the thinning operations can be performed easily and rapidly when the plants are at this stage.

Plate 101.

A Cultivated Clean Field Speeds up the Rate of Thinning, thereby Reducing the Cost of this Important Operation.—These plants average 6 inches tall.

How to Thin.

In thinning, or "chopping," as this operation is frequently called, the most suitable implement to use is a light goose-neck hoe with the length of the handle and the set of the blade adjusted to suit the operator. As the plants should be cut just below the surface of the ground to prevent their regrowth, it is necessary to sharpen the cutting edge of the hoe frequently with a file in order that a clean cut through the cotton stalk is accomplished with each stroke. In this respect, the corners of the cutting edge of the hoe should be kept square and sharp. With a hoe in this condition, the chopping operations can be speeded up through the ability of the user to cut out with the corner of the hoe the unwanted plants in a crowded bunch of seedlings. Where the chopping is done properly the one stroke removes the unnecessary cotton plants as well as any young weed and grass growth that may be amongst them, thus increasing the efficiency of the chopping operations and thereby reducing the cost of production.

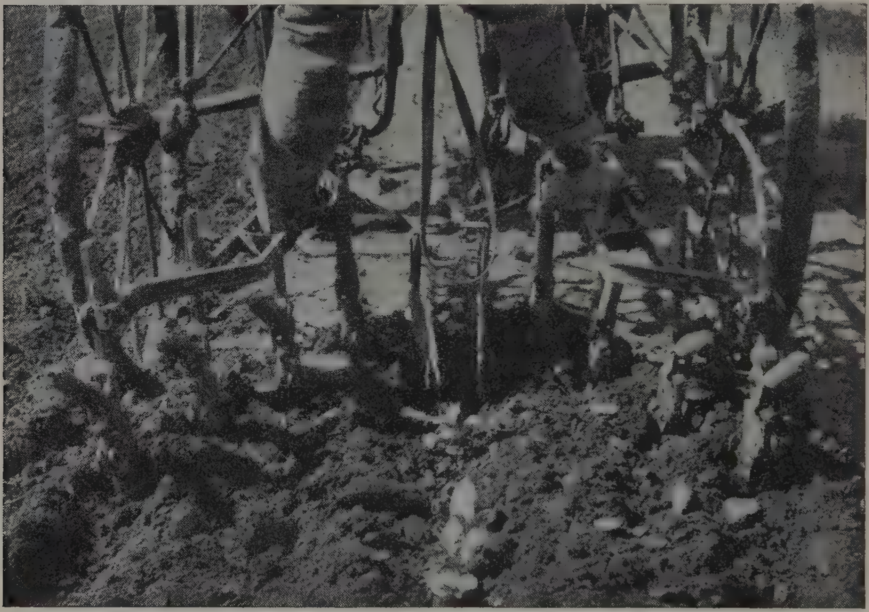

Plate 102.

Illustrating when the First Cultivation of Cotton should be made.—The plants in the foreground were young velvet beans, which are very brittle, yet with the equipment being used no damage was done to them. The soil in which they were growing is of a clayey nature, and the cultivating was done three days after a heavy beating rain.

Cultivating.

The general tendency of growers is to wait until the cotton plants are well developed towards the thinning stage before the first cultivation is made. In many fields, particularly on old cultivations, considerable growth of pigweeds and summer grass will be present by then, especially in a season in which early showers occur, and it will be nearly impossible to destroy all of such growth without hand labour, even with the most efficient cultivators. It is highly advisable to prevent the growth of weeds amongst the young cotton plants in order that the latter will have the benefit of all available moisture during dry conditions. Freedom from weeds will also simplify the problem of insect control. The practice at the Biloela Research Station is to cultivate with a riding cultivator of the foot-steered type as soon as the cotton seedlings are 2 or 3 inches high, using tines 2¼ inches wide, with guards to prevent the soil covering the plants. This eradicates most of the weed and grass seedlings between the rows and establishes a nice mulch around the plants, which helps to prevent the growth of weeds in the row.

If further rainfall is experienced before thinning time, it will be necessary to cultivate again, otherwise no other cultivation is required until the thinning is completed.

This second cultivation may be done by cross-harrowing if the plants average approximately 4 inches in height. Not only will this operation largely destroy weed growth, both between and in the rows, but provided the work is done with a lever-equipped spike-tooth harrow, the teeth can be set so that a certain amount of beneficial elimination of thick stands of cotton plants can be accomplished. This also helps to reduce the cost of hoe thinning. It is pointed out, however, that cross-harrowing should not be done on fields in which sufficient roots, old cotton stalks, or trash occur to clog the harrow teeth enough to drag out an excessive number of the cotton plants.

It is not advisable to use the disc cultivator in the cultivations done before the thinning operations are carried out, for the size of the plants will necessitate setting the discs to cut the soil away from the row. This will leave the plants on a narrow ridge if the discs are set close enough to cultivate efficiently. Such a ridge will dry so hard as to restrict the growth of the young plants unless another cultivation is made soon afterwards to throw the soil back to the plants. Guards should be used in this latter operation to protect the plants from being covered with the loose soil resulting from the double cultivation.

Cultivations after Thinning.

A careful cultivation is given after the crop is thinned to re-establish the mulch between the rows and around the plants. This should be done as quickly as possible after the thinning, on account of the removal of most of the mulch in the row during the thinning operations being conducive to the exposed soil around the plants drying out and setting very hard under either dry conditions or following severe storms. Generally speaking, not more than three or four cultivations should be required after the one immediately following thinning to maintain a satisfactory mulch free of weeds if cotton is grown in rotation with grass land, but more may be required on old cultivations. At each of these operations it is recommended that the soil be worked towards the plants, for not only does the resultant mulch suppress most of the weed and grass growth, thereby conserving the moisture for the cotton crop, but a firm brace is established around the plants which helps to prevent them being blown over when the soil is wet. Where cotton is being grown with supplementary irrigation a cultivation should be given after each watering.

Cultivation Efficiency.

The utmost efficiency should be obtained in the cultivation operations. For most districts it is recommended that the best work can be done with a two-row cultivator of the type where the driver steers the carriage, on which the tines are fastened, with his feet, rather than by depending entirely on guiding the horses. There are several makes of this type of machine on the market, all of which can be equipped with tines, sweeps, duck feet, and in some cases, discs. By using such a type of machine, more efficient work can be done close to the plants than is possible with either the horse-guided rigid carriage types of riding cultivators or the one-horse-drawn scuffler.

It is important, however, to equip the cultivating machine with equipment suitable for each operation that is performed. Thus, when it is desired to establish a deep mulch, especially if the soil has set somewhat, the tines should be used on the machine. If, however, the soil is not set too hard and eradication of weed growth is desired, sweeps or duck feet should generally be used on most soils. Sometimes a combination of tines and sweeps may give the best results.

At times such prolonged wet conditions may be experienced that the cultivating operations cannot be done before an excessive development of weeds and grasses occurs. Under such circumstances a very satisfactory cleaning between the rows may be accomplished with the pony mould-board plough. The procedure is to start near the centre between the rows and make two complete rounds with the plough set shallow and turning the soil each time away from the plants towards the centre. This will leave the plants on a narrow ridge which can then be cleaned satisfactorily and reasonably cheaply with the heavy chipping hoe. As soon as the grass and weed growth in the ploughed middles has dried out sufficiently, the ploughing operations are reversed so as to hill up the soil towards the plants and thus restrict further growth amongst them.

On all occasions the cultivating parts of a machine should be properly set. Likewise, the parts should be kept properly shaped and sharpened. A duck foot that has been used until the point is worn off and the cutting edges rounded, is not suitable for efficient cultivation and destruction of weeds. Similarly, tines which have been worn down until they do not enter the ground at the correct angle are not suitable for economically establishing a satisfactory mulch.

Reduction in Costs of Production Required.

Reducing the cost of production of the pound of raw cotton is a very important factor for the average Queensland cotton-grower. This can be accomplished by increasing the average yield per acre and lowering all costs whenever possible. It is believed that by practising the cotton-grassland rotation and giving careful attention to the various features which have just been touched upon, many growers can undoubtedly substantially reduce their costs of production.

WAGON SEAT.

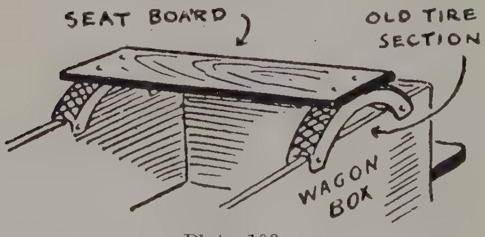

Plate 103.

An excellent wagon seat easy to make and easy to ride on can be made from a short length of board and an old tyre. Two sections are cut from the tyre and nailed to the board the proper distance apart. Heavy duty or six-ply tyres should be used if possible.

The Plough Cultivation of Tobacco.

L. F. MANDELSON, B.Sc.Agr., Research Officer, and H. McNEE, Q.D.A., Instructor in Agriculture.

IN an article on "The Tobacco-Growing Industry in the United States of America," published in the "Queensland Agricultural Journal" in 1936,* a procedure known as plough cultivation was fully discussed. This method differs from the customary procedure used for tobacco cultivation in Queensland in that it consists of carrying out a few very thorough and deep cultivations rather than performing a greater number of shallow cultivations.

Since 1936, plough cultivation has given fairly promising results in field trials, both with improvised implements as well as with special implements more recently introduced from the United States of America for the purpose. Consequently, it might be of interest to discuss briefly these results and to again describe this method of cultivating tobacco.

Field Experiments.

Simple field trials to investigate cultivation as well as fertilizer placement methods were established in various districts during the 1936-37 and 1937-38 seasons. These exploratory trials, which were at Dimbulah, Bowen, and Mackay, yielded results in the first season which appeared to indicate that plough cultivation would be of value under Queensland conditions. Owing to the simplicity of the experimental design and adverse local conditions, however, actual results in yield and value of leaf were not in all cases in favour of plough cultivation.

During the second season the trials, which were established in the Bowen and Mackay districts, were more conclusive. In both cases, plant development during the entire growing season was obviously better with plough cultivation than with the usual method of cultivation with a scuffler. Results, as expressed in average yield per acre and value of leaf, were also slightly in favour of the former method. During the same season a more elaborate type of experiment to investigate cultivation methods as well as plant-spacing distances was established in the Dimbulah district. In this case, also, field observations as well as final results favoured plough cultivation. Actually, on the average, yield was increased from 1,209 lb. to 1,256 lb. and leaf value from £132 to £138 per acre in this experiment.

During the 1938-39 season, the more elaborate type of experiment was again established at Dimbulah. Whereas improvised implements had been used up till this time, a sweep stock with attachments, as well as a plough introduced from the United States, were available for this experiment. The experiment was initiated in late November, and plots for plough cultivation were cultivated with bull tongue and plough two weeks later. Unfortunately, abnormally dry conditions then made further thorough cultivation inadvisable. Consequently, the soil was not again disturbed until mid-January, when, owing to extensive root development, a middle burster was run down the rows instead of using a plough, which would have caused some damage at that time. Although this experiment, therefore, did not receive the full cultivation treatment as planned, outstanding differences in growth in favour of the plough-cultivated plots were soon obvious. It is of interest to note, furthermore, that these plots reached maturity from seven to ten days earlier than those cultivated in the usual manner. The results of this experiment indicated that, on the average, yield was increased from 1,012 lb. to 1,263 lb. per acre, and value of leaf from £76 to £114 per acre by means of plough cultivation.

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* Mandelson, L. F.—The Tobacco-Growing Industry in the United States of America. "Queensland Agric. Journal" 45 : 5 : 461-483; 45 : 6 : 541-574; 46 : 1 : 4-25; and 46: 2 : 143-169. Reprinted as Bulletin No. 14, 1936.

The results of these field trials and experiments, which were established during three consecutive seasons in various districts, suggest, therefore, that possibly better results might be obtained under Queensland conditions by using a plough for tobacco cultivation rather than a scuffler. Accordingly, details of the plough-cultivation method are briefly discussed hereunder, to facilitate its adoption by growers who might wish to give it a trial during the coming season.

Plough Cultivation Method.

The original ridges or hills on which tobacco plants are set out in the field should not be much higher than the surrounding ground level. They are made over drills by a single plough furrow on each side, after the fertilizer has been thoroughly mixed in the drill with a scuffler or some such implement. Frequently the crests of the ridges so constructed are flattened down by dragging a log over the surface.

A week or so after plants have been set out, and as soon as they are established and have commenced to grow, they should receive their first cultivation. This consists of three operations—namely, deep aeration of the soil, hoeing between the plants, and the construction of a broad high hill. The first is carried out with a bull-tongue blade, which is a metal blade 8 to 10 inches by 2 inches attached to a sweep stock (Plate 104; figs. *b* and *e*). With this implement, two deep narrow furrows are made on either side of the row, and as close as possible to the plants without disturbing them. The object to be aimed at is to deeply aerate the soil as closely as possible to the plants. It is inadvisable to leave the soil exposed in this condition for more than an hour before throwing the soil back towards the plants to avoid its drying out. Consequently, as soon as a few rows have been aerated, two furrows are made with a plough on each side of the row. The usual type of pony plough has been found satisfactory for the purpose. Next, the soil crust around the plants should be broken with a hoe. Finally, the hill is still further widened, and the space between the hills is cleaned out by making a furrow down the centre with a sweep blade attached to a sweep stock (Plate 104; figs. *b* and *f*).

When the tobacco is about 6 or 8 inches high, it should receive a second cultivation. On this occasion, however, a bull tongue is not used, since it would tend to cut roots and injure the plants at this stage. This second cultivation consists of (1) making two furrows with a plough on either side of the row; (2) breaking the soil about the plants with a hoe; and (3) cleaning out the space between the rows with a sweep blade.

In some cases, two thorough cultivations may be quite sufficient, but generally it is advisable to make three cultivations during the season. The final cultivation should be made when the crop is about knee high, and particular care should be exercised at this stage to avoid damaging roots growing out into the space between the rows. As with other cultivations, the soil on the hills should be hoed and pulled up well around the plants. After making sure that roots will not be unduly damaged, the hills should be built up with two plough furrows as before. During this final cultivation, soil should be thrown up well towards the plants by suitably regulating the speed of the plough, and eventually the work should be finished off by cleaning out the space between the rows with a sweep. Should it be found that roots have grown too far into the space between the rows, it is then inadvisable to use a plough at all for this final cultivation. In this case, the best procedure is to run a middle-burster (Plate 104, figs. *b* and *c*) or some such implement down the centre of the furrow to throw soil on to the hill with a minimum of disturbance to the tobacco roots.

All the essential operations referred to above are fully illustrated in the bulletin on "The Tobacco-Growing Industry in the United States of America," in which this cultivation method was originally discussed.

Plough Cultivation with Improvised Implements.

Though Queensland farmers have not the actual types of implements used in the United States of America, they may by combining the use of an ordinary pony plough and a scuffler give the crop a satisfactory cultivation, which will embody the principles of the plough cultivation method just described.

In performing the first cultivation a complete round is made with a pony plough, with or without a mouldboard attached, to throw the soil away from the plants. This operation will leave the plants on a narrow ridge 8 to 10 inches wide and 7 or more inches high. Before the soil has dried out excessively another complete round is made with a plough, but in the reverse direction so as to throw the soil back to the plants, and thus rebuild the hills. The untouched area between and around the plants should next be chipped with a hoe. A scuffler with hillers drawn as closely together as possible or with a sweep blade in place of the hillers should then be run between the rows to widen the hills, and to leave a deep narrow drain to carry off storm waters.

The second cultivation, made when the crop is 6 to 8 inches high, is carried out with a plough, as described in the preceding section, and the space between the hills may be cleaned out with a scuffler with sweep blade attached or with hillers drawn close together. Succeeding cultivations, if necessary, may be made in a similar fashion.

Advantages of Plough Cultivation.

The cultivation procedure discussed above has the following advantages over less thorough methods:—(1) Lateral root growth is encouraged which tends to induce more rapid plant growth, larger leaf development, and minimisation of losses by root rots. (2) The possibility of the soil becoming water-logged after heavy rain is reduced by better drainage. (3) The width of the hills tends to reduce the rate at which the soil dries out during prolonged dry weather. (4) The abovementioned factors tend to produce greater returns per acre.

It has been found that about 1 acre per day may be cultivated when the plough cultivation procedure is used. Some growers may consider that this rate is unduly slow. It is better, however, to cultivate 1 acre thoroughly in a day rather than 4 acres less effectively in the same time, if in the latter case the land has to be recultivated frequently and the final result is inferior. The cultivation trials discussed above suggest that this is actually the case.

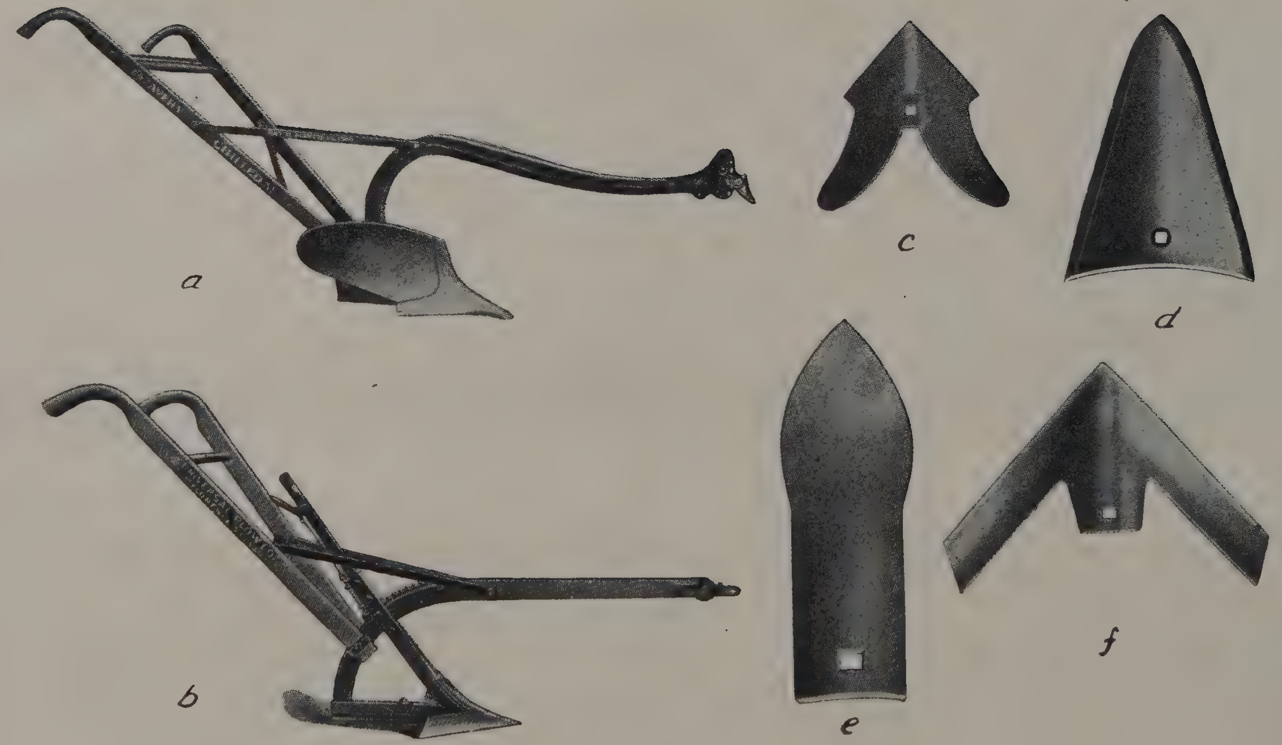


Plate 104.

THE PLOUGH CULTIVATION OF TOBACCO.

Fig. *a*. Plough. An American "turning" plough which is very similar to the light single furrow or "pony" plough used in Queensland.

Fig. *b*. Sweep stock with wing sweep blade attached. The attachments (*c*), (*d*), (*e*), and (*f*) are all used with this stock.

Fig. *c*. Middle-burster blade used for final cultivation when root development does not permit the use of a plough.

Fig. *d*. Shovel plough blade used for laying-out drills in which fertilizer is placed prior to hilling-up.

Fig. *e*. Bull tongue blade used for deeply aerating soil close to young tobacco plants when first cultivated.

Fig. *f*. Wing sweep blade used for cleaning out the space between tobacco rows after each plough cultivation.

Hybrid Maize for Queensland.

W. W. BRYAN, M.Sc.Agr., and A. J. SCHINDLER, B.Sc.Agr., Plant Breeding Section, Queensland Agricultural College.

HYBRID maize has been such a remarkable success in United States of America that probably over one-fifth of the American corn acreage of 100,000,000 acres will this year be sown to hybrids. The average increase in yield is about 15 per cent.

The purpose of this article is to tell what is being done in Queensland to produce maize hybrids, to give the production figures of a few of the better hybrids, and also to tell of some of the steps proposed for the introduction of suitable hybrids into Queensland maizegrowing.

What is a Maize Hybrid?

As far back as 1926 a hybrid maizebreeding programme was begun at the Queensland Agricultural College, Queensland being the first Australian State to realise the value of maize hybrids. The old breeding methods of various types of selection, of the crossing of varieties, and so on, will no longer give marked improvement. In order to make big forward strides we have first to go backwards. That is to say, the first step in the production of vigorous high-yielding hybrids is to produce inbred lines, which themselves are so weak, low-yielding, and unprepossessing that no maizegrower in his right senses would treat them with anything but utter scorn. Yet, generally, five to eight years' work has to be done on their production and testing before any use can be made of them. The procedure is to select desirable plants from as wide a range of varieties as can be obtained. These selections are then inbred for a number of generations, and by rigorous selection during inbreeding undesirable types are eliminated. After several years then we finish up with a number of inbreds. These are tested for high-yield capacity and other characteristics, the better ones retained, and the breeder is then ready to begin the production of hybrids from them.

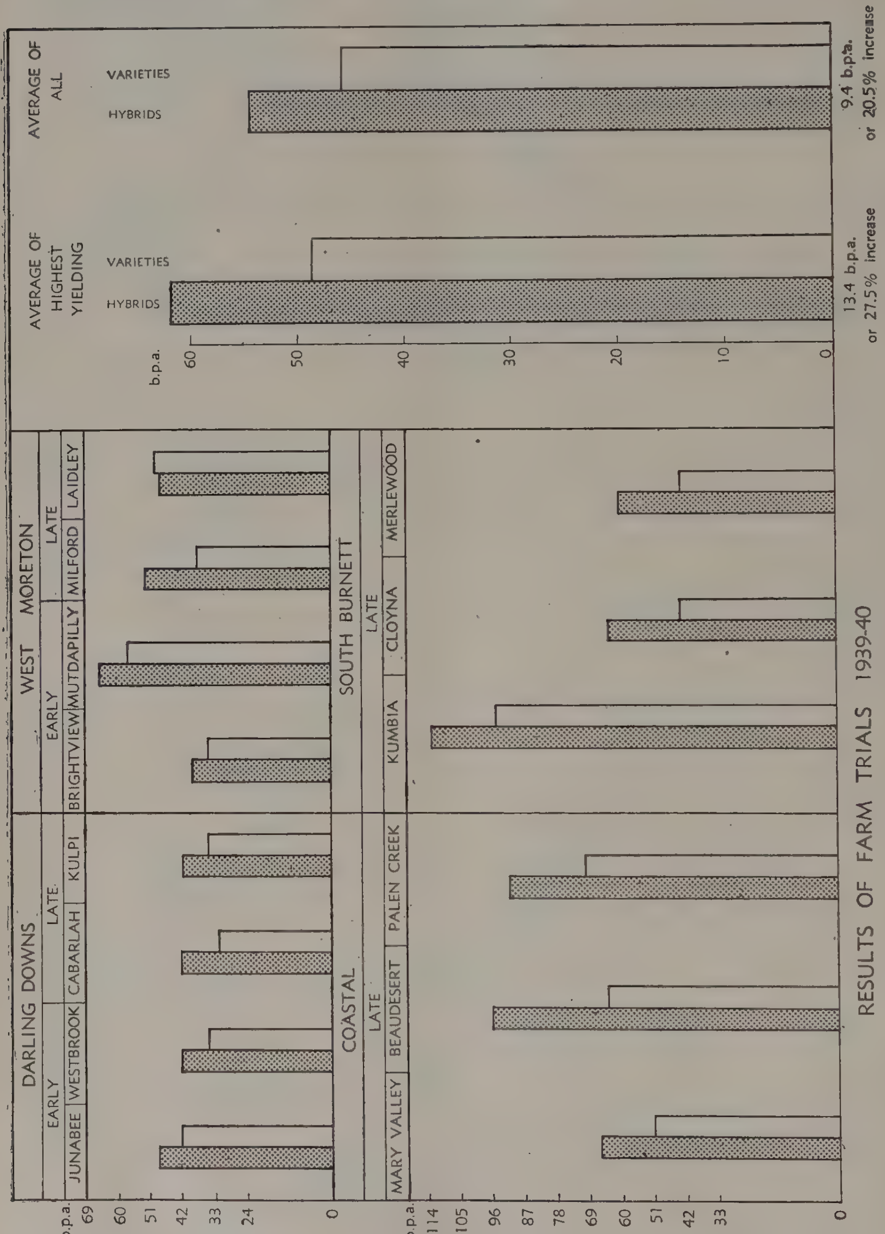
In Queensland, some 500 varieties derived from many parts of the world have been subjected to inbreeding, and from well over 5,000 initial plant selections we now have about sixty inbreds, with which we are working. The average yield of the majority of these inbreds is only 10 to 15 bushels per acre. These then form our building blocks. What sort of structure can we build with these blocks?

The inbreds are crossed in pairs to produce single crosses or foundation hybrids, and the best of the single crosses are combined in pairs to make double crosses. The seed of the best of these double crosses is used by farmers for their ordinary corn crops. When inbreds are combined, there is an immediate and great manifestation of hybrid vigour, as you will see when we quote yield figures shortly. But not every hybrid is a good one (it depends on the heredity received), and not every good hybrid is necessarily suited to more maize areas than a few. Every likely hybrid produced has, therefore, to be tested for yield in trials, which should be located as widely as possible over the maize areas of the State. This work we are now beginning to do.

Testing Hybrids for Yield.

Naturally, the first and the most extensive testing is done at the breeding station, and we now have yield data for the College for the past five years. But Lockyer conditions are different from those of other parts of the West Moreton, or the Darling Downs, or the South Burnett. In consequence of this, the testing of hybrids for yield now runs on the following lines:—

The College has made and initially tested at the College nearly 2,000 hybrids of various types. All but 300 of these have already been discarded. Each year between 3,000 and 4,000 yield trial plots are planted and harvested. The hybrids are compared with each other, and



RESULTS OF FARM TRIALS 1939-40

Plate 105.

also with three standard varieties. These varieties are each the best of its type, selected after variety trials which were conducted for several seasons. Of the 300 remaining hybrids, some thirty have so far been outstanding, and these thirty were selected for wider testing.

The present testing plan provides for farm trials throughout South-eastern Queensland, every major maize area being represented. In these trials on private farms, for whose continuance we are indebted to the loyal co-operation of farmer friends, six or seven hybrids have been planted, together with the farmer's own variety and with two standard varieties chosen as being most suited to the locality.

Results of Yield Tests.

In 1939-40 fourteen trials were harvested. Additional trials planted on the Darling Downs at Westbrook and near Clifton were destroyed in the early stages by grasshopper invasions.

Method of Procedure.

Each trial consisted of a randomised block design, with six replications. Plots were each of two rows, 44 feet long, plot size 1/110 acre, with lanes of 3 feet between ends of plots. Two guard rows were sown along each outer edge of the trial. Planting was done by hand by a member of the College staff, the planting of each trial being completed within a half-day period. Each trial was sown in part of a maize paddock, which assisted in ensuring that during growth the crop received only normal cultivation.

Harvesting was carried out by the College Plant Breeding Section, the crop being husked as it was pulled. After pulling, the plots were immediately shelled in a small portable sheller and weighed. From each of three replications a 2-lb. sample was taken for the determination of moisture content and damaged kernels (disease estimation). All yields were finally computed on a 14 per cent. moisture basis before being statistically analysed. In the notes on each trial which follow, differences which are statistically significant are marked with an asterisk. The fully detailed results of each trial are not given, as undue weight should not be given to the results of a single season. In fact, the chief justification for publication at this stage is the good agreement shown by the results of last season's farm trials and the results over several seasons past at the College. This agreement appears to justify the belief that the favourable results now put on record should be repeated in future seasons.

DETAILS OF FARM TRIALS.

Trials of Early Hybrids.

West Moreton—Brightview.

Co-operator	Mr. F. Heiner.
Planted	7–8–39.
Soil type	Black friable loam.
Climatic conditions ..	Long dry period after sowing, then very hot. Generally unfavourable.
Harvested crop ..	Somewhat pinched and small grain.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid ..	38·6	Highest yielding variety ..	34·2	4·4	12·8
Average of all hybrids (7)	33·8	Average of all adapted varieties (3)	31·0	2·8	9·0

Darling Downs—

(1) Junabee.

Co-operator	Mr. V. Braithwaite.
Planted	2–11–39.
Soil type	Red volcanic loam.
Climatic conditions ..	Long dry period after planting. Generally only moderately favourable.
Harvested crop ..	Fair condition.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	48·4	Highest yielding variety..	41·9	6·5	15·5
Average of all hybrids (6)	43·0	Average of all adapted varieties (3)	39·7	3·3	8·3

(2) Westbrook.

Co-operator	Farm Home for Boys, Westbrook.
Planted	30–11–39.
Soil type	Typical Downs black soil.
Climatic conditions ..	Hot, dry period after planting. Only moderately favourable.
Harvested crop ..	Fair condition.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	42·1	Highest yielding variety..	34·5	7·6	22·0
Average of all hybrids (6)	37·1	Average of all adapted varieties (2)	33·8	3·3	9·8

Trials of Late Hybrids.

West Moreton—

(1) Mutdapilly (near Harrisville).

Co-operator	Mr. H. Reed.
Planted	27–10–39.
Soil type	Black moderately light silty clay loam.
Climatic conditions ..	Only moderately light rain during growth.
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	65·0	Highest yielding variety..	57·1	7·9	13·8
Average of all hybrids (7)	61·2	Average of all adapted varieties (2)	54·2	7·0	12·9

(2) Milford—Low-hill country south-east of Boonah.

Co-operator	Mr. A. N. Krey.
Planted	29–11–39.
Soil type	Black loam (brigalow).
Climatic conditions ..	Only slight rain during growth. Dry heat wave at tasselling.
Harvested crop ..	Of fair appearance.

—		—		Difference.	
				Hybrid.	Variety.
				p.b.a.	per cent.
Highest yielding hybrid..	51·7	Highest yielding variety..	37·7	14·0	* 37·1
Average of all hybrids (7)	45·1	Average of all adapted varieties (3)	31·0	14·1	45·5

(3) Laidley.

Co-operator	Mr. M. Lester.
Planted	24–1–40.
Soil type	Sandy loam (light scrub).
Climatic conditions ..	Good until flowering, then extremely dry until harvest.
Harvest	Most of the grain light, chaffy, and obviously seriously affected by dry conditions.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	47·8	Highest yielding variety..	49·2	—1·4	— 2·8
Average of all hybrids (7)	41·7	Average of all adapted varieties (2)	48·6	—6·9	—14·2

Darling Downs—

(1) Cabarlah (13 miles North of Toowoomba).

Co-operator	Mr. H. Adams.
Planted	13–11–39.
Soil type	Reddish brown sandy loam.
Climatic conditions ..	Dry, very hot after planting to tasselling. After tasselling the trial was invaded by grasshoppers and many of the lower leaves completely eaten.
Harvest	Shallow grain generally.

—		—		Difference.	
				Hybrid.	Variety
				b.p.a.	per cent.
Highest yielding hybrid..	42·4	Highest yielding variety..	31·5	10·9	* 34·6
Average of all hybrids (7)	35·1	Average of all adapted varieties (3)	27·3	7·8	28·5

(2) Kulpi (Cooyar Line).

Co-operator	Mr. L. Garvis.
Planted	22–11–39.
Soil type	Black slightly sandy loam.
Climatic conditions ..	A little rain in the month after planting. Dry, and heat wave at tasselling.
Harvest	Ears generally small and thin. Yields of two of the varieties were so low that they were not weighed.

				Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	41·2	Highest yielding variety..	28·4	12·8	* 45·1
Average of all hybrids (7)	32·9	Average of all adapted varieties (1)	28·4	4·5	15·8

(3) Nobby.

Co-operator	Mr. G. Christian.
Planted	4–1–40.
Soil type	Typical Downs black soil.

The trial was eaten by grasshoppers when some inches high.

Coastal—

(1) Mary Valley.

Co-operator	Mrs. A. M. Poulsen, Beechwood.
Planted	31–10–39.
Soil type	Dark-grey alluvium.
Climatic conditions ..	Generally fair
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	65·5	Highest yielding variety..	50·5	15·0	* 29·7
Average of all hybrids (7)	59·0	Average of adapted varieties (2)	45·5	13·5	29·7

(2) Beaudesert.

Co-operator	Mr. E. M. Shaw, Nyama, Innis Plain.
Planted	20–12–39.
Soil type	Black clay alluvial.
Climatic conditions ..	Generally fair.
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	95·7	Highest yielding variety..	63·6	32·1	* 50·5
Average of all hybrids (7)	83·7	Average of adapted varieties (2)	63·2	20·5	32·4

(3) Palen Creek.

Co-operator	Palen Creek Prison Farm.
Planted	20–12–39.
Soil type	Dark-grey loam (basaltic).
Climatic conditions ..	Generally fair.
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	90·6	Highest yielding variety..	69·6	21·0	* 30·2
Average of all hybrids (7)	84·2	Average of adapted varieties (3)	67·1	17·1	25·5

South Burnett—

(1) Kumbia.

Co-operator	Mr. J. C. Noller.
Planted	1–12–39.
Soil type	Red loam, virgin land.
Climatic conditions ..	Highly favourable for maize.
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	112·8	Highest yielding variety..	94·2	18·6	* 19·7
Average of all hybrids (7)	105·7	Average of adapted varieties (3)	88·1	17·6	20·0

(2) Murgon (Cloyna).

Co-operator	Mr. J. A. Heading, Highfields.
Planted	31–10–39.
Soil type	Dark-grey volcanic loam, long cultivated.
Climatic conditions ..	Long dry period after planting which delayed germination. Severe heat wave about flowering time. Otherwise satisfactory.
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	62·9	Highest yielding variety..	43·1	19·8	* 45·9
Average of all hybrids (7)	53·4	Average of adapted varieties (2)	41·8	11·6	27·7

(3) Murgon (Merlwood).

Co-operator	Mrs. J. M. Wisseman.
Planted	2–12–39.
Soil type	Red volcanic loam, old cultivation.
Climatic conditions ..	Severe heat about flowering time. Otherwise fairly satisfactory.
Harvested crop ..	Normal.

—		—		Difference.	
				Hybrid.	Variety.
				b.p.a.	per cent.
Highest yielding hybrid..	60·2	Highest yielding variety..	42·5	17·7	* 41·6
Average of all hydrids (7)	54·9	Average of adapted varieties (2)	40·1	14·8	36·9

RECORD OF SOME INDIVIDUAL HYBRIDS.

Hybrid.	Tested at—	Hybrid Average.	Best Variety Average.	Hybrid Increase.	
		b.p.a.	b.p.a.	b.p.a.	per cent.
Late Hybrids—					
A ..	College, 5 years; Cabarlah, Mary Valley, Beaudesert	52·8	38·8	14·0	36·1
B ..	College, 6 years; Carbarlah, Murgon, Boonah	46·6	38·0	8·6	22·6
C ..	College, 5 years; Murgon, Mutdapilly, Beaudesert	48·0	38·6	9·4	24·4
D ..	College, 5 years; Kumbia, Beaudesert, Palen Creek	59·6	52·2	7·4	14·2
E ..	College, 6 years; Laidley, Kulpi, Mary Valley, Beaudesert ..	48·7	42·2	6·5	15·4
F ..	College, 6 years; Beaudesert, Laidley	46·9	42·5	4·4	10·4
Early Hybrid	College, 1 year; Junabee, Westbrook	41·5	38·6	2·9	7·5

Summary of Yield Tests.

To summarise, it would appear that by using the better hybrids an increase of about 20 per cent. may be expected for those areas for which the particular hybrid is suited. We feel that this increase, which is 6 to 10 bushels per acre on the average, fully justifies an attempt to introduce maize hybrids to Queensland farmers.

Warning!

Here let a warning be sounded. The hybrids which have been developed up to the present are only suited to South-east Queensland. Moreover, hybrids will not immediately, or, perhaps, for a long time, displace the present standard varieties on all farms. There will continue to be a demand for good varieties for many years. If you have a really good variety, do not lose it. It will still be of considerable value. Another very important point is this: No seed for further planting can be taken from a hybrid crop. Seed from such a crop, however attractive it may appear for seed purposes, will produce a crop yielding from 15 per cent. to 25 per cent. less than the original crop of hybrid. A hybrid is a mule in the sense that it does not reproduce its kind. For this reason, fresh seed of hybrids has to be obtained each year from some seed-producing source. This is a real objection to the use of hybrids, but it fades into insignificance in comparison with the advantages that hybrids give.

Trial Seed Samples.

It was mentioned before that the hybrids are tested for yield and other characteristics at the College and on private farms throughout South-eastern Queensland. These trials will be continued and, if possible, extended. But conditions of soil and rainfall vary from farm to farm, so that the results of a trial, say, in the Murgon area, may not hold for every farm in that area. To overcome the difficulties of this variation from farm to farm, there are available for the coming planting season small free samples of seed of promising hybrids (1-lb. samples), which are available to any maizegrower who would like to try for himself the possibilities of hybrid corn. As the amount of seed on hand for samples is limited, conditions have to be imposed in the distribution of the samples in order that the best use may be made of the seed available. These conditions are, briefly, that the grower receiving a sample should promise to plant the hybrid in competition with his own choice of variety according to a simple but definite plan of alternate pairs of rows, and that the results of his test should be made available to the breeding station. Applicants for a sample should apply to the Plant Breeder, Queensland Agricultural College, Lawes, when they will be supplied with full details. The area required for the farm test will be ¼ to ⅓ of an acre. Most of the hybrids available are late types, but there will be a few early types available. The distribution of samples will be continued in future seasons.

This, then, completes the testing scheme—i.e., initial testing at the College, carefully conducted trials throughout the maize districts, and the distribution of small samples of the more promising hybrids to individual farmers. The question naturally arises: ''but how can we obtain seed of hybrids in larger quantities sufficient for our planting requirements?'' This question will be answered later when we know better which hybrids are finally to be used.

Other Objectives.

High yield is not the only objective of our breeding work. At the same time we are subjecting each hybrid to searching scrutiny for any weaknesses. To be retained, a hybrid, however high yielding, must equal or better the best of our present varieties in such things as root and stalk strength, good husk cover, ability to turn its ears down at maturity, resistance to earworm, weevil, aphids, and to ear and stalk rots and other diseases. Any major weakness is sufficient to have it rejected.

Another point we have in mind is that our hybrids should be dual-purpose types—i.e., they should have a green fodder yield equal to our good varieties, in addition to their superior grain yield. This eliminates the need for a farmer who requires both green fodder or silage as well as grain from having to use more than one hybrid.

The maize-breeding work as a whole is designed, not with a view to the extension of existing maize areas, but to give increased yields in the present recognised maize areas—i.e., to lower the present cost of production, or, in other words, to give an increased margin of profit.

Sheep Feeding Methods.

J. M. HARVEY, M.Sc., Department of Agriculture and Stock.

THE secret of success in drought feeding lies mainly in correct management of the property. A judicious subdivision of paddocks is necessary to enable feeding in mobs of convenient size. The manager must be able to recognise when his animals should be fed. This means the commencement of feeding at an early stage, because it is not an economical proposition to feed once the animal starts to draw heavily on its muscle. The classing of sheep according to strength is important. By dividing into three groups, say, a hospital mob, weak mobs, and strong, it is possible to feed differently according to requirements and to a certain extent nurse the poorer sheep. The nature of the property will, of course, have a considerable influence on the type of feeding and the management of the flock.

In general, when the country starts to go off during a dry spell, although there may be a large body of dry grass, this has lost a considerable amount of two of its essentials, viz., protein and minerals. At this stage a supplement should be supplied preferably in the form of a lick. For example, this could be supplied by a mixture of bone meal, vegetable protein meal, and a small amount of salt. The quantity of bone meal, which is very unattractive to sheep, could be increased rapidly once the animals are accustomed to the lick and in this way limit the consumption. The protein meal serves a double purpose. It provides an adequate supply of protein, which is essential for maintenance of muscle, and it enables the animal to make much better use of some of the otherwise undigested carbohydrate material in the grass itself. Good bone meal, in addition to 28 per cent. phosphate and 32 per cent. lime, also contains 17 per cent. of protein material.

The next stage in feeding is when the country has started to slip badly. No longer can the sheep obtain an adequate supply of carbohydrate, or energy food, from the scanty pasture, even with the assistance of a protein supplement. At this stage some cereal meal must be fed together with the protein. The type of cereal meal to be fed will be largely governed by price and quality, as there is very little difference in the digestible carbohydrate content, with the exception of oats.

The final stage of feeding is, of course, on bare country. Even at the previous stage, viz., when the country has deteriorated badly, it may be economical to adopt this type of feeding. In the first place, temporary fencing will have to be erected to keep the animals in fairly small enclosures. This is important, as it prevents a considerable energy waste expended by the sheep in walking over a large area in search of food. Also, it serves to spell the large paddocks which will then pick up much more rapidly when rain does come. Naturally, these enclosures will have to be shifted from time to time, as the ground will become very dusty and contaminate both wool and food.

It has been quite definitely established that it is possible to maintain dry sheep on concentrates only. Care, of course, will have to be exercised when such sheep are brought back on to roughage, especially if the feeding period has been a long one.

In the case of lambing ewes and lambs, the feeding of roughage is essential. It is important, however, to avoid selective feeding, and for this reason concentrates and roughage are not fed together. The best plan is to set aside two days in the week when roughage only is fed.

The feeding of ewes and lambs presents quite different problems of management and feeding from the handling of dry sheep. Lambing ewes will require about three times the digestible protein, twice the digestible carbohydrate, and about twice the lime for a dry sheep. Consequently, they will require a ration high in protein and minerals prior to lambing and afterwards for the production of milk. In the case of lambs, an inadequate supply of roughage prevents the proper development of the paunch. Such development cannot take place in later life, and the result is a sheep with an insufficient food storage capacity.

Lambing in a drought then presents these alternatives—

(1) Feeding of lambs with their mothers.

(2) A method of creep feeding.

(3) An early weaning of lambs.

1. The first type is generally uneconomical.

2. The second has been found quite successful. Small enclosures are erected close to where the ewes are fed and arranged so that the lowest strand of wire or rail of the fence is about 8 inches above the ground. This allows access of the lambs and a separate means of feeding, although the lambs are still running with their mothers.

3. The third type has been used to advantage on many properties. Lambs start to take an interest in feeding at about fourteen to nineteen days. In general, however, lambing takes place over about six to eight weeks; so that it is certainly not possible to wean the lambs as they reach a particular age. What can be done is to wean the whole flock, say, at fourteen days after lambing ceases. There are then only two possible rations for the rearing of such lambs, i.e.—

(i.) A ration of good-quality, bright lucerne and maize or other suitable meals.

(ii.) If lucerne is unprocurable, either bright, good-quality wheaten or oaten together with a good growing mash from a reputable poultry firm or its equivalent.

In the former case, whole maize must not be fed to lambs. The best proposition is maize meal, but whole maize soaked in water for twelve hours and drained is fairly satisfactory.

Now, as regards methods of feeding, there are two alternatives—(1) trough feeding, and (2) broadcast feeding.

The broadcast method, although still in use, is rapidly being replaced by the former. It presents three very great disadvantages—

(*a*) While protein food is available in nut forms—e.g., Meggitts nuts, cotton-seed nuts, Thorpe's cubettes, carbohydrate feeding is limited, irrespective of price to whole maize. As previously stated, this must be avoided in the case of lambed ewes, or, at least, the maize must be soaked, and this necessitates some form of trough feeding.

(*b*) The sheep uses up energy which he cannot afford in a wild scramble after the food lorry.

(*c*) The ground is quickly powdered up by the sheep and considerable quantities of earth are taken in together with the food.

There are several types of troughing in use at present. The most satisfactory but most expensive is a type of self-feeding hopper. This consists of a V-shaped container over a feeding tray. The tray is arranged about 15 inches above the ground and is gravity-fed from the container. The whole structure is protected from the weather by an iron or fibrolite roof.

Log-troughing is very successful and convenient if there are facilities on the property. If handy to a timber mill, low-grade 8-inch boards can be made into either V or U-shaped troughs.

Some considerable success has been achieved in the past using fibreen. This is a special water-proof material bought in rolls cut to suitable width—e.g., 30 inches. It is bellied out and fastened by means of clips or tie-wire to two parallel strands of fencing wire, supported at about 8-feet intervals by suitable stakes. Lately, however, some samples have not shown to advantage when subjected to vigorous feeding on bare country.

Iron troughs are in use, but this commodity is practically unprocurable at present. Bag troughing both fouls and tears easily, but in case of necessity it is possible to peg out bags on the ground.

For the feeding of hay, experience has shown that the most satisfactory method is a wire rack. This is constructed by bellying out wire-netting of large mesh between two parallel rows of posts carrying a top rail. The posts should be arranged at a height such that lambs have access to the lowest part of the netting. This ensures them the bulk of the leaf, as it naturally falls to the bottom of the rack. It is considered an advantage to peg out bags underneath the rack both to prevent any wastage of leaf and to eliminate the possibility of lambs eating earth together with the fallen leaf.

The use of troughs has brought about two systems of feeding. In certain localities success has been claimed by a system of controlled feeding by the addition of some unattractive material to the ration. This material must, of course, have no harmful and preferably a beneficial effect on the sheep. The obvious advantages of such a method is the much less area of troughing required and the fact that two and three days' supply of food can be put out at once.

However, even in areas where it has been found impossible to obtain a satisfactory control and consequently necessitated a large increase in area of troughing to enable all animals to have access to the trough at the one time, it is admitted that the trough system is definitely superior to any broadcast method.

In conclusion, it is considered that the ideal system of feeding lies in the use of numbers of scattered troughs of the hopper type. These can be used as lick troughs, and when supplementary feeding is necessary, protein meal and cereal meal can be introduced as required. This, of course, like any other system, demands continuous attention and careful management.

Variation of the Prussic Acid (HCN) Content of *Sorghum verticilliflorum* at different stages of growth.*

W. R. WINKS, B.Sc., A.A.C.I., Analyst, Department of Agriculture and Stock, Queensland.

SORGHUM verticilliflorum, commonly known as Wild Sorghum, "is a tall, robust, perennial grass, 6-8 feet high or more, the leaves and stems often stained a purplish red by bacterial infection; not producing underground runners as in Johnson Grass" (*Sorghum halepense*), with which it is often confused, "but perennial through buds developed at the base of the stems. Leaf-blades 9-18 inches long, ½-¾ in breadth, uppermost leaf sheaths about 1 foot long, lower ones successively shorter; ligule silky, hairy. Inflorescence (seed head) 12-18 inches long and about 12 inches across. Spikelets of two sorts, the smaller, narrower ones males or sterile, the larger, plumper ones female or fertile. Fertile spikelets ¼ inch long, covered with brown silky hairs; awn brown, bent and twisted, ½ inch or more long." (White, "Queensland Agricultural Journal," April, 1937, p. 368.)

The plant is a native of Africa, though it is now naturalised to many warm countries. In Queensland it finds its greatest development in the coastal part of the State from Brisbane to Bundaberg, but is found as far north as Cairns and as far west as Emerald and Hughenden.

Material and Methods Used.

The material used in this investigation was natural growth obtained from a plot 12 feet by 18 feet in the grounds of the Department. This plot was first cut short and cleaned of weeds, and the subsequent ratoon growth used for analytical purposes.

Cuttings were first made at monthly intervals, but during the early investigations the growth was so rapid that it was decided to halve the plot and analyse the new growth at weekly intervals, while monthly determinations were continued on the original growth. The samples selected consisted of one stalk from each of several stools. New growth appeared after each cutting, but only those stalks which had started to grow before the previous cuttings were selected for determinations.

The whole plant was used for the determination of HCN for most of the period, but as the stalks hardened some determinations were made of the leaves alone. In the older plants secondary growth took place from the nodes, and this growth matured in time and set seed.

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* Contribution No. 11 from the Poison Plants Committee, Department of Agriculture and Stock, Queensland, established as the result of a grant from the Australian Wool Board for the purpose of conducting investigations with plants suspected of being poisonous to stock.

Monthly cuttings commenced in October, when growth—about 2 feet per month—was rapid. In May half of the plot was cut, and the subsequent young growth tested at weekly intervals. From May to August growth was slower—about 2 feet 6 inches over the whole period. Unfortunately, owing to pressure of other work, it was not possible to maintain the regular cuttings; hence the results are shown in tabular form instead of graphically.

The method employed in determining the HCN content was that described by Finnemore and Williams ("Australian Journal of Pharmacy," January, 1935, p. 41), with the slight modification that the HCN was absorbed by a saturated solution of $NaHCO_3$ and titrated directly with N/20 iodine. Emulsin was employed as an enzyme instead of the ground sweet almonds used by Finnemore and Williams.

Simultaneously with the HCN determination, a moisture analysis was carried out on portion of the sample at 105 deg. C.

The results are set out in the following tables:—

TABLE I.

Lab. No.	Date Collected.	Moisture.	HCN in— Mgs. per 100 Gms. Green Sample.	HCN in— Mgs. per 100 Gms. Moisture-free Plant.	Remarks.
2912	25/10/38	% 86·2	24·7	179·0	Height 2 ft. 3 in. Whole plant.
3443	21/11/38	77·4	21·3	94·3	Height 5 ft. 6 in. Whole plant.
4094	21/12/38	63·5	17·9	49·0	Leaves only. Height 7 ft. 6 in. In tassel.
4800	23/1/39	60·0	15·9	39·8	Whole plant. Height 8 ft. In seed with about half of seed fallen. Stalk very coarse.
4800	23/1/39	57·6	32·4	76·4	Leaves only of previous sample No. 4800.
5880	1/3/39	62·9	19·5	52·5	Whole plant. Height 7 ft. 6 in. All seed fallen.
5880	1/3/39	68·5	66·1	209·8	Leaves only. Mostly regrowth from nodes.
6557	3/4/39	63·7	13·4	36·8	Whole plant. Height 7 ft. 6 in. Old seed fallen and seed heads dry. Many new seed heads from secondary branches.
6556	3/4/39	71·4	47·1	164·6	Leaves only of 6557. Mostly on branches from nodes.
7174	2/5/39	59·7	10·1	25·1	Whole plant. Height 7 ft. 6 in. New secondary branches in seed.
7174	2/5/39	67·4	22·1	67·8	Leaves of previous sample No. 7174. Mostly from branches.
8832	27/6/39	58·1	13·2	31·5	Whole plant. Height 7 ft. 6 in. No seed. Very old.
8832	27/6/39	60·9	24·8	63·5	Leaves only, mostly from branches.
963	7/8/39	55·2	9·2	24·8	Whole plant. Height 7 ft. 6 in. A little seed on secondary growth. Very old.
963	7/8/39	66·5	24·8	74·1	Leaves only, almost entirely from secondary growth.

TABLE II.

Lab. No.	Date Collected.	Moisture.	HCN in— Mgs. per 100 Gms. Green Sample.	HCN in— Mgs. per 100 Gms. Moisture-free Plant.	Remarks.
		%			
6981	24/4/39	89·2	56·4	522·7	Height 4 in. to 6 in. Whole plant.
7175	2/5/39	89·3	31·0	289·8	Height 6 in. to 7 in. Whole plant.
7405	9/5/39	88·1	30·8	258·7	Height 6 in. to 9 in. Whole plant.
8833	27/6/39	83·8	32·1	198·5	Height 2 ft. Whole plant.
340	10/7/39	85·1	16·7	112·1	Height 2 ft. 3 in. Whole plant.
432	17/7/39	82·3	15·9	90·0	Height 2 ft. 3 in. Whole plant.
714	24/7/39	83·2	16·7	100·0	Height 2 ft. 3 in. Whole plant.
789	31/7/39	81·7	5·1	28·0	Height 2 ft. 3 in. Whole plant. Evidently some error in this determination.
965	7/8/39	82·5	17·3	98·8	Height 2 ft. 3 in. Whole plant.
3335	13/11/39	77·0	21·3	92·7	Height 2 ft. 6 in. to 3 ft. Whole plant.

Conclusions.

1. *Sorghum verticilliflorum* is dangerous to stock throughout the entire period of its life. In this respect it differs from the cultivated sorghums.

2. This danger is due to the secondary growth, which frequently contains considerable quantities of HCN.

3. Ratoon growth during autumn and winter (Table II.) frequently contains considerable quantities of HCN. It would therefore constitute a special danger where other feed is scarce.

TOOL RACK.

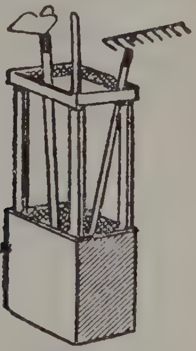

Plate 106.

To keep together those small farm tools that are usually out of place when wanted it would be a good idea to make a tool rack. A small, strong box, with a top like the one shown in the drawing can be made in a few minutes. It will hold hoes, forks, crowbars, and many other tools. A couple of these made on rainy days will save a hunt for tools when wanted in a hurry.

Milking Methods—A Comparison.

W. J. PARK, Dairy Branch.

CAREFULNESS in the production of milk is obviously of the first importance in respect of quality, but in order that the work may be done efficiently and conveniently, certain facilities are essential. The use of steam for sterilisation in the dairy industry has made rapid progress in the past two years. The equipment of the dairy shed with an approved steam steriliser, where milking machines are in use, is now a compulsory requirement under *The Dairy Products Acts.*

With the object of ascertaining under everyday average dairying conditions in Queensland the efficiency of steam in comparison with other methods of cleansing dairy utensils, and particularly milking machines, data accumulated from routine tests over a period of four months on the Darling Downs have been analysed. The test used for the purpose was the well-known methylene blue reductase test,* the samples being distributed into four grades according to the reduction times, as under:—

Grade 1—(Well-produced milk). Reducing methylene blue in over 4 hours.
Grade 2—(Satisfactory milk). Reducing methylene blue between 2 and 4 hours.
Grade 3—(Unsatisfactory milk). Reducing methylene blue between 1 and 2 hours.
Grade 4—(Very unsatisfactory milk). Reducing methylene blue in less than 1 hour.

For the purpose of determining the relative efficiency of methods of production under varying conditions, the samples of milk examined were divided into the following groups:—

Group 1—Milk produced by hand-milking.
Group 2—Milk produced by machine-milking on farms equipped with steam sterilisers.
Group 3—Milk produced by machine-milking on farms not equipped with steam sterilisers.

The total number of suppliers to four cheese factories was 72, their distribution in the foregoing groups being—

Hand milking farms	27
Machine-milking farms equipped with steam sterilisers	21
Machine-milking farms without sterilisers	24
Total number of farms	72

During the investigation, 814 samples of milk were examined, the samples being taken from the suppliers at each of the factories at regular intervals. All tests were made on samples of the evening's milk upon its arrival next morning at the factory, and thus, as the samples were about 16 hours old when tested, considerable multiplication of the original bacterial flora had occurred. The investigation also was undertaken in the warmest months of the year.

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* "Queensland Agricultural Journal," August, 1938.

In Table 1 are summarised the results of all tests during this investigation, together with those obtained from a similar investigation made at a number of cheese factories during the previous summer.

TABLE 1.

—	Distribution of Samples according to Reduction Times.			
	Less than 1 Hour.	1–2 Hours.	2–4 Hours.	Over 4 Hours.
Summary of 814 tests, Jan.–May, 1940—				
No.	315	179	229	91
Percentage	38·7	22·0	28·2	11·1
Summary of 526 Tests, Oct.–March, 1939—				
No.	351	86	60	29
Percentage	66·7	16·3	11·4	5·5

A comparison of the results for each of the summer periods reflects the improvement of the quality of the milk supply achieved as a result of the educational and advisory assistance given to producers at this group of factories during hot weather. Incidentally, it emphasises the value of regularity of testing at cheese factories of milk supplies as a means of fostering enthusiasm among producers, and affording them a measure of the efficiency of their daily operations.

In Table 2 the results of all methylene blue tests made on the milk of suppliers in each group are classified according to reduction times:—

TABLE 2.

—	Distribution of Samples according to Reduction Times.			
	Less than 1 Hour.	1–2 Hours.	2–4 Hours.	Over 4 Hours.
Machine-milked samples (With steam steriliser)—				
No.	47	31	87	33
Percentage	23·7	10·6	44·0	21·7
Hand-milked samples—				
No.	90	56	69	38
Percentage	35·9	22·1	27·3	14·7
Machine-milked samples (Without steam steriliser)—				
No.	178	92	73	20
Percentage	49·0	25·3	20·1	5·6

In a previous paper by Rice* covering tests prior to the introduction of steam sterilisation on Queensland dairy farms, it was established that machine-produced milk was then of inferior bacteriological quality to hand-produced milk. Steam sterilisation was suggested as a means of solving the problem of maintaining mechanical milking plants in a sanitary condition.

Of the 72 farms included in the present investigation, 21 were operating milking machines equipped with steam sterilisers, 24 were using milking machines but had not provided sterilisers, and 27 were hand-milking and did not have steam sterilisers.

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* "Queensland Agricultural Journal," November, 1939.

The results of the tests carried out regularly on the milk supplied by these three almost evenly numbered groups of producers, all situated in the same locality, should, therefore, enable the efficiency of steam sterilisation under practical conditions to be compared with the efficiency obtainable under otherwise similar conditions on farms not using steam sterilisers and farms employing hand milking. Under *The Dairy Produce Act,* the compulsory requirement of steam sterilisation applies only to users of milking machines, dairy farms on which hand-milking is employed being exempt.

Table 2 clearly reveals that milk of satisfactory bacteriological quality can be produced with milking machines if an approved dairy shed hygiene technique embracing steam sterilisation is applied in their use; in fact, a considerably higher proportion of the satisfactory samples were produced on farms combining machine-milking and steam sterilisation than under hand-milking conditions, while on farms operating milking machines without sterilising facilities the least satisfactory results were obtained.

Summary.

Eight hundred and fourteen samples of milk which had been held overnight on the producing farms at ordinary summer evening temperatures before arrival at the factory and sampling were examined. Seventy-two farms were covered by the investigation. The results disclosed that the quality of the milk, depending on production methods, varied in the following order:—

(1) Milk produced on farms using milking machines in conjunction with steam sterilisation—65·7 per cent. of the milk samples examined from supplies in this group were of satisfactory quality.

(2) Milk produced by hand-milking (without steam sterilisation) —42·0 per cent. of the samples examined from supplies included in this group were of satisfactory quality.

(3) Milk produced on farms using milking machines, but without adequate washing and sterilising facilities—25·7 per cent. of the samples examined from suppliers included in this group were of satisfactory quality.

NOTICE TO READERS.

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Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Gambia Pea as a Green Manure Crop.*

H. W. KERR.

FROM time to time progress reports have been issued to keep cane growers informed regarding the trials which have been made with this green manure species, which gave promise of becoming a standard crop for green manurial purposes.

During the 1939-40 growing season a substantial number of moderate plantings were made in most cane areas of the State, and these have been the subject of close supervision by the field officers of the Bureau. Based on the reports received, the following comments are offered for the guidance of growers generally.

Plate 107.

ILLUSTRATING A YOUNG GAMBIA PEA CROP AT THE BUNDABERG STATION, JANUARY, 1940.

Some fourteen trial plots were planted in the area from Mossman to Babinda, on all major soil types. While there were some disappointments, due to a variety of causes, most of the farmers are seeking seed for further plantings, this year. In some cases excellent crops were produced, exceeding 6 feet in height at maturity. One of the accompanying illustrations shows a crop grown on a Babinda gravelly slope: it will be seen that the horse plough is making an excellent job of covering it.

One major advantage which it possesses over other species in these parts is that it not only produces a heavier weight of green matter to be ploughed in, but it does not flower until April and is thus providing a cover during the period of heavy rains, by which time most legumes have seeded and died. It might be noted, in passing, that the value of these latter crops is by no means lost for this reason: but it must be admitted that best results will follow where the succulent crop can be turned under to rot, instead of decomposing on the ground surface. Little of the valuable nitrogen will be lost due to this cause, but the mellowing effect of the decomposing organic matter on the soil is dissipated.

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* From *The Cane Growers' Quarterly Bulletin*—Bur. Sugar Expt. Stns. (Dept. Agric. and Stock, Q.)—for October, 1940.

With plantings extended from mid-October to mid-January, the better results were obtained for the earlier plantings. Those planted late were not satisfactory. Soil type seemed to have little influence on germination and growth, as splendid crops were obtained on sands, gravels, schist, and clay loams.

Plate 108.

SHOWING ONE OF THE BEST CROPS PRODUCED LAST YEAR ON MOURILYAN SANDY SOIL.

Germination varied considerably. It was mostly slow, taking from one to three weeks, and in many cases it was patchy in point of both time and position in the block. It would appear that one fault lay in burying the seed unduly. A small seed such as this gives best results when covered very lightly, and some of the best germinations were obtained where the field was merely rolled after the seed was sown. However, this had no undue influence on the speed of germination, and it would appear that some experimentation is necessary to determine how this can be accelerated. Soaking the seed before broadcasting, in either hot or cold water, may be found beneficial.

In its early stages of growth the crop makes slow progress, and in general it appears that weeds and grasses would smother it. But when this initial period is past, it makes very rapid headway and completely controls its competitors.

About 10-lb seed should prove sufficient to sow an acre. Care is required to get an even spread, and it is advantageous to mix it with a proportion of dry sand or sawdust to improve the distribution. If the germination is complete, the field produces a close stand of upright plants which give little branching. Where the stand is more sparse, the individual plants will spread and branch, covering an overall width of 2 to 3 feet.

Practically all crops flowered in April, irrespective of planting time, but seed was not set until late in May. A continuous ground cover for from five to seven months is therefore possible. Although small patches in wet fields died out, due to wilt, this trouble was not nearly so bad as is experienced in similar circumstances with Poona pea, and should definitely not be regarded as a deterrent, even in the wettest districts.

Plate 109.

Illustrating the Ease of Ploughing Under a Heavy Crop, on Babinda Gravelly Soil.

The ploughing under of the crop is a simple matter. Being upright in growth habit and free from runners, the touch of the plough disc turns it over. In a heavy crop at Mossman, the rubber-tyred tractor tended to slip on the heavy mat of material. The plant tissue, even when fully mature and with enlarged stems, does not offer much resistance to rotting. The stems are remarkably free from long fibre, and are rather pithy in structure.

Experience in the Innisfail district, with some fifteen plots, was generally similar to that recorded for the north. The season was by no means a good one for green manure crops generally, but the results with Gambia pea were, on the whole, satisfactory. All plantings which were made in a fine, moist seed bed and covered lightly, germinated and grew well; those made in a dry seed bed, and for the most part deeply covered, germinated poorly and produced an indifferent stand of fairly well-grown plants.

Its reaction to the heavy wet season conditions of this area appears highly satisfactory, and it is definitely superior to the green crops usually grown: the resistance to floods is remarkably good, and the species deserves attention in respect of soil erosion prevention. One crop which was submerged for several days did not suffer any loss of plants, while an adjoining crop of Mauritius bean was practically killed off.

It is considered that best results will be obtained if seeding is carried out during November and early December, in a fine, moist seed bed, covering with a light leveller or peg-tooth harrow.

Yields estimated for those crops which made reasonable growth, ranged from 10 to 30 tons per acre of green matter. Perhaps the best crops in these parts, illustrated in Plate 108, was produced on an area of sandy soil in the Mourilyan area.

During late 1939 it was arranged to have plantings of Gambia pea made in the southern areas of the State where legumes are grown for the purpose of seed collection. An estimate of yields from these sources indicates that 2 or 3 tons of seed will be available, and arrangements are being made for the sale of the crop in all major cane areas. Farmers desiring seed should get in touch with their local District Executive secretary, with whom we have had correspondence on the matter. The Bureau has no seed for sale, so enquiries should not be directed to the Experiment Stations or to the Brisbane Office.

To assure a seed supply in the future, we would recommend to cane growers who have well-seeded crops, to gather the pods when mature, and thrash them out after drying. It is not a particularly troublesome business. Incidentally, it is not anticipated that much difficulty will be experienced in controlling young seedlings of the species, should a crop mature seed before it is ploughed under.

* * *

A HORSE'S NOSE-GUARD.

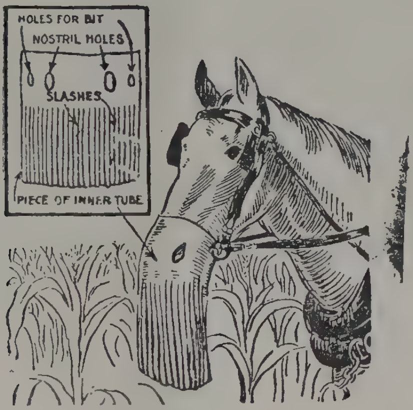

Plate 110.

A simple guard that will help keep insects from bothering the nose of a working horse, and also prevent the animal from constantly nibbling at growing crops, can be made from a piece of inner tube as indicated. The large holes cut in the rubber should coincide wtih the horse's nostrils so that its breathing will not be impeded. The guard will also tend to discourage a horse that has acquired the habit of nipping at another when they are yoked together.

The McNichol Grader-Leveller.*

H. W. KERR.

IN recent years cane growers have devoted considerable time and effort to permanent farm improvements which are calculated to enhance both the yielding capacity of the land and the convenience of working the farm. In this respect land grading has been concentrated upon, in its influence on drainage properties of wet blocks, and ease of irrigation in areas such as the Lower Burdekin. This project is one which demands careful forethought and intelligence, so that undue removal of fertile surface soil and the creation of sterile patches may be avoided; and also a high measure of skill in scooping the ridges and depositing the soil in hollows.

During a recent visit to the Mackay district, the writer was interested to see demonstrated an implement which should prove extremely useful as an adjunct to such work; though it was intended rather to put the finishing touches to an otherwise good job of grading, the machine is actually a combined grader and leveller, and under demonstration it was at times moving almost a full cubic yard of loose soil.

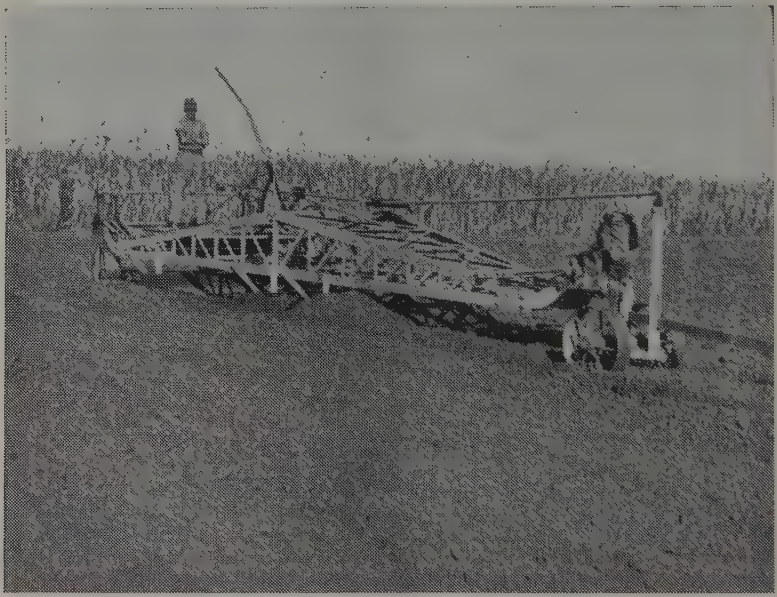

Plate 111.

THE LEVELLER OPERATING IN A SCOOPED FIELD.

The accompanying illustrations (Plates 111, 112) demonstrate the essential features of the unit. It was designed by Mr. W. McNichol, a canegrower of Palmyra, Mackay, who has had extensive experience in converting a poorly-drained area into land of better than average yielding capacity. One of the chief features of the machine is the long wheel base, which is essential for accurate levelling. This machine has an overall length of 30 feet, and a width of 9 feet. By means of levers the elevation of the machine may be adjusted fore and aft on the wheels. It is fitted with three blades, each 1 foot in depth. The front blade, which is set at right angles to the frame, is 8 feet wide; the middle blade is set at a slight angle to the front blade, and is 8 feet 6 inches wide; while the rear blade, also set at a slight angle, but in the opposite sense from the central blade, is 9 feet wide.

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* From *The Cane Growers' Quarterly Bulletin*—Bur. Sugar Expt. Stns. (Dept. Agric. and Stock, Q.)—for October, 1940.

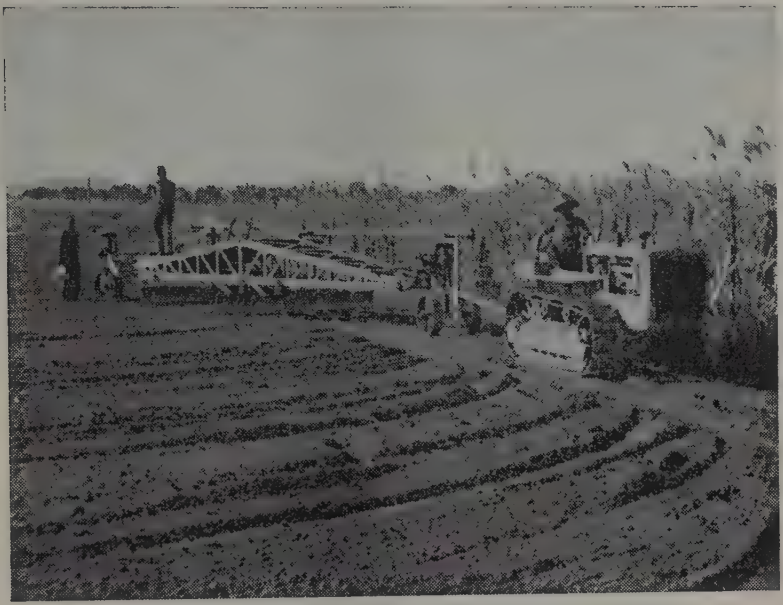


Plate 112.
Illustrating how Readily the Leveller may be Turned on the Headland.

Plate 113.
An Example of the Class of Work Done by the Leveller.

The frame of the machine is constructed of ¼ inch angle iron of suitable section, and it is welded into a very strong and rigid unit. It was constructed by a Mackay engineering workshop.

A very interesting feature is the coupling of the front and back wheels in such a manner that they operate in opposite directions, when turning, and the leveller can actually be turned on a headland 25 feet wide.

A high-powered tractor is, of course, necessary for hauling the machine. A 35-h.p. diesel unit is found to be most satisfactory, and it may usually be operated in second or third gear; this is, of course, governed by the load which it is required to move. The depth of the blades may be regulated while working. Where a high ridge is encountered, a large amount of soil may be taken off and carried along until a depression in the surface is met. The efficiency with which the machine is operated may be gauged from the accompanying illustrations (Plates 112, 113). On this field it was working, with the tractor in second gear, at a speed of 2½ miles per hour. With reasonable field length, 2 acres of land may thus be covered in an hour. For best results, the field should be worked over twice, either in the same direction, or at right angles to one another.

Plate 114. [*Photo.: Bur. Sug. Expt. Stns.*

TWO EXCELLENT GRAIN SORGHUM HEADS PRODUCED AT THE BUNDABERG SUGAR EXPERIMENT STATION.

Grafting Male Papaw Trees.

W. G. HANCOCK, Fruit Inspector.

THIS method of papaw grafting was evolved as a means of working over male papaw trees in the plantation, and with reasonable care, a really keen knife, and attention to details it is quite easy to do. The results approach 100 per cent. success, and a very strong union results.

Papaw tissue appears to be naturally very ready to unite, but the copious flow of sap, and the liability of the cut surface to rots, and the tendency of the stock to die back for a few inches are the main difficulties to be overcome. Moreover, scions while keeping fresh and turgid under suitable conditions will quickly wilt when exposed to dry air.

Plate 115.

GRAFTED PAPAW, FOUR MONTHS AFTER GRAFTING.

The stage preferred for grafting is when the stocks are between 1½ inches and 2½ inches in diameter; also, the first flowers usually appear at this stage, and the sex can be determined.

The scions are side shoots from a mature tree; about 6 to 8 inches long is handiest, and the best are those which have a small hard knob at the base. If desired, a mature tree known to bear good fruit can be cut back some time before it is known that some grafting will be necessary. Indications are that in a comparatively short-lived plant like the papaw, shoots from a comparatively young tree are better than those from an aged tree. When grafted, the latter tends to produce a tree which appears senile from the beginning. Remove the leaves from the scions, leaving a short stub of the petiole. Rinse these in a strong solution of potassium permanganate and keep them wrapped in a cloth wrung out in it.

A very keen, thin-bladed grafting knife for the grafting cuts and a stronger knife for preparing the stock and some raffia are required.

Drive a stake as near as possible to the tree without injuring it, and bind the top of the tree to the stake to prevent movement. Make a horizontal cut nearly three-quarters through the stock about 6 inches from the ground. The stems are solid at this point. Then commencing about 10 inches above this cut take out a deep slice from the stem. Swab all cut surfaces with potassium permanganate solution, but do not allow any on the actual grafting surfaces. This appears to hasten callousing and stops the flow of sap. In the step so formed the cleft is made as near to the standing part as possible. The scion is cut wedge-shaped similar to an ordinary cleft graft, but as papaw tissue is very soft it is best to slightly shape the cleft and wedge to prevent undue pressure when the former is inserted. Bind with raffia, and mound up with moist sandy soil to just cover the tip of the scion. The portion of the trunk is left standing to maintain a flow of sap past the graft and prevent die-back.

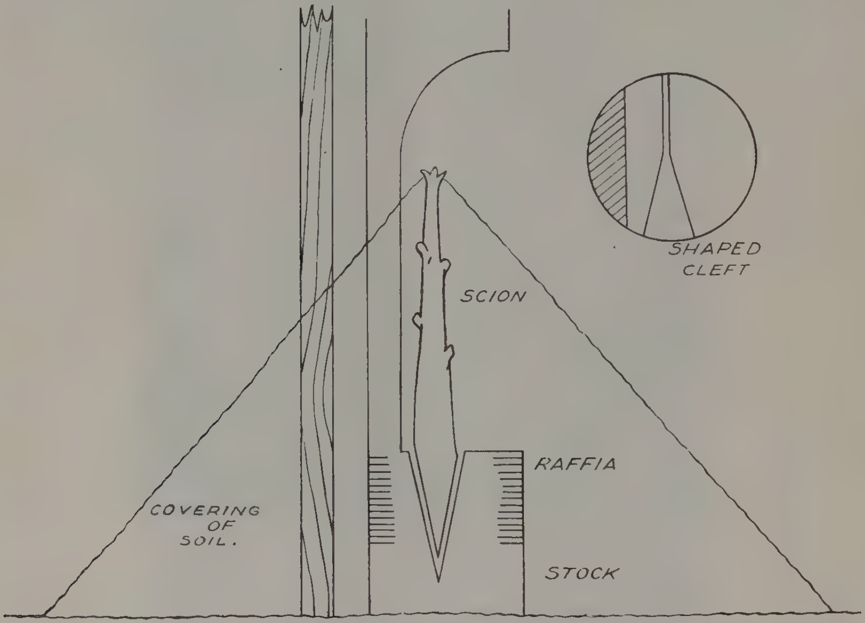


Plate 116.

Papaw Cleft Graft.

In fourteen days the soil can be gently removed. By this time the raffia is rotted and the graft has either taken or failed. If the graft has taken, gently mound it up again. Growth should commence in about another two weeks, and when it has definitely started the standing part of the stock is cut off level, but the graft is kept covered with soil for a while to hasten a complete union and protect it from the heat of the sun.

The rapidity with which papaw tissue callouses under cover of moist earth is remarkable. In the case of the graft, whereas the surface of the lower sliced-away portion will have completely calloused in a fortnight, the top uncovered part will probably be already dry and shredding. Also, if a handful of moist soil is plastered over the cut top of a tree, which for some reason or other has been cut down, it will very quickly heal over perfectly, instead of shredding and rotting back.

This graft has proved successful in North Queensland and also has been successful on occasions in southern districts of the State.

SHEEPYARD GATES.

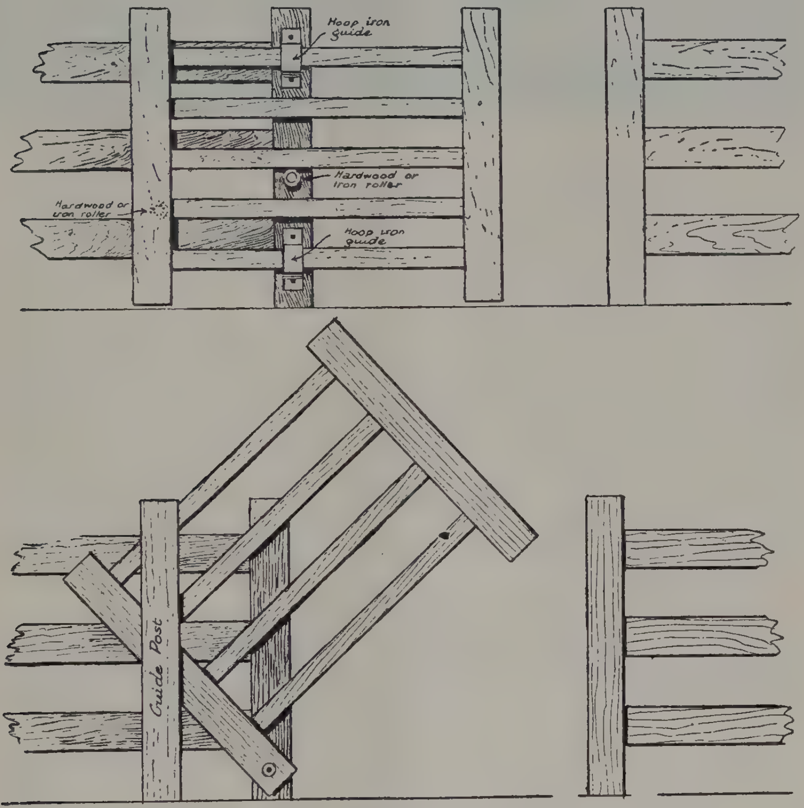
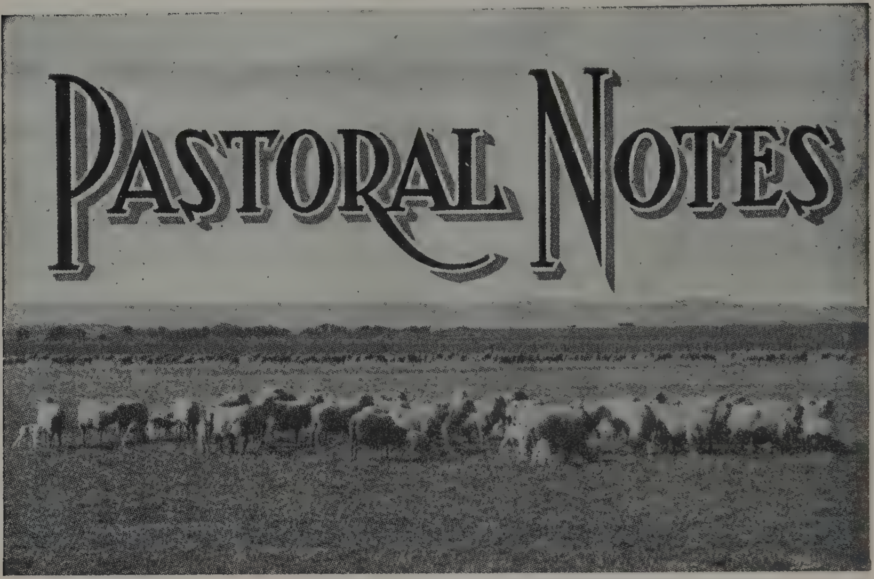


Plate 117.

Here are sketches of two types of sheepyard gates. Where only small gates, say, 4 or 5 feet wide, are required, these types should prove handy, as with adjoining yards full of sheep it is often difficult to close or open swinging gates. No such disadvantage exists with either of these gates, as one slides across and the other lifts. The sketches are intended to convey the idea only, details of construction, hinging, and fastening being left to the ingenuity of the maker.



Acute Bloating of Cattle.

ACUTE bloating of ruminants, cattle particularly, may occur at any time from a variety of causes, but most commonly through turning hungry cattle on to luxuriant green feed, or on to herbage country, after heavy rains and when the young herbage is making rapid growth.

Under station conditions, where stock are not seen every day, little can be done to prevent loss, but on smaller holdings losses may be minimised if a stack of dry hay is provided and to which stock have access before and after being allowed on to green feed. The long, dry hay assists regurgitation, which is difficult when large quantities of short, succulent feed has been eaten, and, if it is available, animals will always take a few mouthfuls, with beneficial results.

Symptoms of bloating appear quickly. Animals stop feeding and stand still with arched backs, turning their heads frequently to the abdomen, which increases rapidly in size—the swelling becoming most marked on the left side. As the abdomen enlarges, breathing becomes more and more difficult. In very acute cases the nostrils dilate, the animal stretches out its tongue, bellows, and finally staggers and dies in convulsions.

In less acute cases the development of gas is slower, and frequent belching and vomiting prevents its excessive accumulation. In these cases the use of a gag made from a stick about 8 inches long and 2 inches in diameter, with holes at each end through which a thin rope is run to form a rough bridle—the stick being smeared with tar or grease before being put into the mouth—is of value, as it facilitates belching.

Massage of both flanks, applying moderate pressure with both fists upwards and downwards—particularly over the whole of the left flank—while the animal stands with its head uphill, is also beneficial.

Puncture of the rumen with a trocar and canula saves many valuable animals. The instrument must be sterilised by boiling for ten minutes before use. It is wise to keep it ready, wrapped in a sterile towel. The trocar, with its protecting tube, is pushed into the most prominent point of the left flank, usually midway between the point of the hip and the middle of the last rib. Holding the instrument in the left hand, a sharp blow with the palm of the right hand causes it to penetrate the skin, abdominal wall, and the rumen.

The point of the trocar is directed towards the right elbow.

The trocar is withdrawn gradually from its sheath, allowing the gas to escape slowly, giving immediate relief to the animal.

When gas ceases to escape, a cork may be used to close the canula, which is left in position and secured by a clean bandage tied over it and round the body of the animal. Any further accumulation of gas is allowed to escape slowly by removing the cork. When no longer required the canula is withdrawn, and the small puncture dressed with tincture of iodine.

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WOUNDS IN HORSES—SIMPLE TREATMENT.

The fundamental principle underlying all wound treatment is the provision of suitable downward drainage for the discharges from the wound. If such drainage is provided, then most wounds tend to heal well, but deep wounds penetrating downwards and which form pockets do not progress satisfactorily, for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little treatment, beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds, it is necessary to use a knife judiciously in order to allow the discharges a free outflow.

Before any wound treatment is attempted, the injured edges of the wound should be clipped with scissors to remove the hair and reveal the true nature of the wound. The next thing to do is to wash the wound thoroughly with a warm, weak disinfectant solution. Then, if necessary, the depth of the wound can be explored with a blunt probe which has been boiled, or with the fingers after the hands have been thoroughly washed and scrubbed. Punctured wounds—such as nail or stake wounds—are always difficult to drain and often have to be opened up. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature may gather in the foot, and may continue to accumulate because it cannot drain away. If that happens, acute lameness is certain to follow. If unattended, these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by that time the structures within the foot are in a nasty mess and the case has become very serious.

To treat hoof punctures, the whole foot is cleaned and, if possible, it is held in a bucket of warm disinfectant solution to still further cleanse it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole at the point where pain is most acute. The apex of the cone must be carried right through the horn until blood or pus is revealed. The pus should then be allowed to drain away. To prevent the hole from closing, a pad soaked in a solution of iron perchloride should be placed in the wound, and the treatment should be repeated daily while necessary. If treated thoroughly in the way described little further attention is necessary.

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SELECTING THE SITE FOR A WELL.

On many grazing properties in Queensland there is sufficient surface water to last until June or July in a normal year, and possibly until August in a good year, when there has been a heavy wet season. There is a period between the time that the surface water dries up and the first storms fall in which it is necessary to provide water, either by well or bore.

When selecting a site for a well or a bore, the grazier should first make a survey of his country. A site should, if possible, be selected on a part of the property where cattle do not feed intensively when surface water is available. On a number of grazing properties the mistake has been made of putting down a bore in close proximity to surface water. As the surface water dries up, the grass in the immediate vicinity is also eaten out, and when it is necessary to pump water for stock there is often no grass anywhere near the bore or well. As a result, the stock are forced to walk long distances to grass.

When bores and wells are put down in places away from surface water, there will probably be grass near at hand in a dry time, and cattle will do better, drink oftener, and retain condition that they would otherwise lose through excessive walking.

SHEEP RAISING NEAR THE COAST.

Farmers on coastal country who are desirous of stocking sheep usually ask the question how to start to the best advantage. Conditions and circumstances along the coast vary so greatly that no hard and fast rules can be laid down.

It is usually considered that where dairying, pig raising, and mixed farming can be successfully combined in coastal areas the conditions are favourable for fat lamb raising. There is one chief guiding point, and that is, where the rainfall can be considered as excessive for the combination mentioned, it will be decidedly against the wellbeing of sheep.

For fat lamb raising the British breeds should be used. The most suitable of them is the Romney Marsh, and the wetter the conditions the nearer to the pure Romney Marsh the breeding flock should be. If crossbred or Corriedale ewes are not available, then strong-woolled, plain-bodied merino ewes should be introduced, to which should be mated pure Romney Marsh rams. Of the progeny, ewes should be retained for breeding and the wethers used for home consumption or sold as fat lambs. Merino ewes should not be retained on the coast for longer than two seasons.

All lambs should be marked during August, and the ewes shorn in September. If the ewes are healthy and well fed from the time the lambs are dropped, all lambs that are to be sold should be fit before or during December. A month after the lambs are disposed of, the ewes that are to be sold should be fat and sold as such to secure best results. Healthy merino ewes with good teeth and carrying not more than four or five months' wool should fatten on good feed in three or four weeks.

CLASSING THE CLIP.

As the great bulk of the wool produced in Queensland is merino, there is no great difficulty in having it classed properly. Most Queensland pastoralists keep their sheep in as good condition as seasonal and other circumstances permit, and do everything else necessary to produce a good clip of wool.

To add to the benefit of good flock management, the clip should be classed to best advantage. The large flock owner realises that it pays to obtain the services of a highly qualified classer to do the work. It has been the get-up of these clips which has gained for Queensland clips the confidence of buyers. To retain this confidence and to have it extended to manufacturers is most important. It should be understood that station brands are well known to both buyers and manufacturers, and if the wool is classed and baled in keeping with the requirements of the trade, the owner is bound to obtain the full benefit of a properly classed clip.

Some buyers deal chiefly in long staple, and others require shorter wools, and they will buy with confidence if they are sure of getting the type they require, and not a mixture of lengths and qualities. Yield also has a considerable influence on values; and as values are based on suitable length and spinning quality, as well as yield, the importance of maintaining lines of even standard should be obvious. As the wool is purchased on a clean-scoured base, the purchaser of greasy wool must calculate the percentage of the clean product he will obtain, therefore, the more even respective lines are in length, spinning, quality, character, soundness, colour, and condition, and yield, the more accurate he will be in appraising the true value of each class. Not only in large, but also in the smaller clips, correct classing is important, especially under changing selling conditions. Arrangements have been made for the purchase of the whole of the Australian wool clip by Great Britain, with control of selling procedure vested in a central wool committee.

All wool has now to be submitted for appraisement, and experts appointed by the central committee are responsible for its valuation. This means that classing to obtain the best returns for the grower will be even more necessary than under the former system of auction sales, although both brokers and their experts receive and handle clips as usual.

Where small owners are concerned, the expense of a qualified classer may not be warranted, especially where family labour is utilised. To assist them, the Department of Agriculture and Stock is prepared to instruct them in the classing of their own clips.

Farmers' Wool Scheme.—A scheme also is in operation which is limited to those who run 1,500 sheep or less, British breeds and crosses, and odd lots, bags and butts from any holding, for which 10s. per bale is charged for classing. The only preparation necessary is the removal of wet stains. An advance of 60 per cent. of the estimated value of the wool free of interest to owners running less than 1,500 sheep is made on consignments.

The Dairy Farm

Dairy Practice.

MAXIMUM results on the dairy farm can only be obtained by the successful combination of three factors—the farmer, the pasture, and the stock. The farmer must efficiently mange and improve his pastures, while the stock must give the highest possible amount of milk fat from the quantity of food consumed.

The farmer may claim that he has good cows, and produce factory returns as evidence thereof. That evidence, however, is merely proof that the herd is good, not that each individual member is good. Until he submits his herd to regular testing, he has no definite proof that his herd contains no unprofitable cows, that his herd sire is at least maintaining the production in the younger stock, or that he is breeding from the right cows. A record of any drop in factory returns is an open book to the regular testing farmer, but a sealed book to the farmer working solely on factory returns.

If the position is to be improved by herd testing, the responsibility is on the farmer to consider the individual results and carry out the necessary remedies. Failure to act on the part of the farmer cannot be held against herd testing.

The fertility of the land must be maintained if the pastures are to carry the stock economically. Each cow returns to the soil a proportion of the plant food it consumes in the form of manure, which should be regularly broken up and distributed by harrows. The plant foods which are not returned to the pastures are those which make the milk and those used to produce and maintain the body of the animals. A cow which produces 500 gallons of milk in a lactation period, equivalent to approximately 200 lb. of fat, removes from the pasture at least 7 lb. of lime and 11 lb. of phosphoric acid in the milk alone. This is equivalent to approximately a half-hundredweight of bonedust or superphosphate. Thus a herd of forty such cows would remove yearly the equivalent of 1 ton of those fertilizers from the pasture. As a large proportion of Queensland soils are deficient in phosphorus, particularly in coastal areas, a loss such as this is a very serious matter, and if not returned to the soil in some form, pastures will deteriorate, and conditions conducive to the occurrence of stock diseases peculiar to phosphorus deficiency may develop.

There are various ways in which these plant foods can be returned to the pastures. The obvious method is to distribute the phosphatic fertilizer over the pastures; a less obvious but efficient method is to administer at least 2 oz. of bone meal to each cow daily. This weight only makes good the calcium and phosphorus removed in the milk and is distributed over the pastures in the droppings.

The introduction of improved pasture grasses and the adoption of rotational grazing would also assist materially in obtaining the maximum efficiency on the dairy farm.

COMMON DEFECTS IN CREAM.

Following are the causes and remedies of some common defects in cream faults:—

Over-ripe Cream.—Caused by the cream developing excess acidity, by skimming cream too thin, or by infrequent deliveries to factory.

Do not skim cream below 40 per cent. test. Cool and aerate cream on the farm. Deliver to factory frequently—daily when possible.

Staleness.—Caused by keeping cream too long in the dairy. Often the balance after filling the cream can is held until next delivery, and held at too high a temperature.

Send all the cream in the dairy to the factory on days of delivery. Keep cream cool while on the farm.

Ropy Cream.—Caused chiefly by bacteria in water, especially in swamps and stagnant dams also by unclean, dusty yards and bails, dairies, and utensils.

Prevent cows from wading in stagnant waters; udders and flanks of cows should be washed and wiped before milking. Premises and utensils should be kept clean. This defect is very difficult to overcome, unless clean methods are adopted generally in dairy work. Use soda when washing utensils, and boiling water to scald all utensils. At least once a day remove all cow droppings 100 feet from dairy yards and bails.

Curdy Cream.—Caused by skimming too thin, insufficient skimming discs in separator bowl, by keeping cream at high temperatures, or by adding warm cream to cool cream.

Keep cream cool. Skim cream at a 40 per cent. fat test; be sure there are enough discs and that they are tight in the bowl of the separator. Mix fresh cream with older cream only when both are at the same temperature; give the whole an occasional stir to make the mass uniform, and stir at least four times daily.

Fermented Cream.—Caused by the development of bacteria, mostly the result of unclean methods in dairy work. Thin separation contributes to the trouble; also inadequate cooling, and the mixing of thin warm cream with older lots.

Give strict attention to cleanliness in plant and premises, using boiling water morning and evenings; wash udders of cows and see that hands of milkers are clean. Skim cream not less than 40 per cent. test; mix different separations as described for curdy cream.

Cowy Flavour.—Caused by absorbing offensive smells from dirty bails and yards—such as floors and drains saturated with urine—especially in wet weather; also by milking unhealthy cows, and milking cows too soon after calving.

To remedy this defect, see that bails and yards are kept clean; hard-surfaced yards are easiest to keep in a sanitary condition. Remove dung daily from the main yard. Never use milk from sick cows, or from cows too soon after calving.

Rancid Cream.—Caused by over-staleness, the result of not delivering to the factory frequently enough. This class of cream is condemned, being unfit to manufacture into butter. Caused also by contamination from cracked or badly mended utensils.

Cleanliness should be observed, with frequent delivery to the factory. Cracked and badly repaired utensils which have become impossible to clean thoroughly should be dumped.

BLOOD MEAL FOR DAIRY STOCK.

Blood meal feeding to dairy cattle presents little difficulty when the meal is fresh and free from objectionable odour. It may be incorporated in the regular feed or mixed with appetising foods, such as maize meal, bran, pollard, and cotton seed. Care should be taken, however, to see that the feed box is kept clean.

In the presence of moisture, blood soon fouls and an objectionable smell results from the fermentation. Stock dislike this intensely, and it may be difficult to get animals into the bail where such food has lain.

THE CARE OF CREAM IN TRANSIT.

A contributing factor in the low grading of some cream at the butter factory is often lack of thought and care for it while in transit. Some farmers blame cream carriers or railway officials for any deterioration which occurs while it is on the road; but, presumably, if the carriers and the railwaymen do neglect to give the extra care which cream needs, particularly in hot weather, they may be merely following the example of indifference displayed by the owner of the cream.

For example, cream may be brought in by a farmer and left at the station overnight to be consigned by a train timed to leave, say, at 7.20 next morning. Mostly such cream comes from farms only 2 or 3 miles distant. Surely, any dairyman who takes a pride in turning out choice cream can arrange such a short journey in the three hours of daylight before train time. The owner should realise the deterioration which must develop in cream in cans which may be left to stand at the station for twelve hours lidded down and unstirred through a warm night; but let the train be an hour late and hear the complaints about the neglect of the Railway Department!

A less frequent fault in delivering cream too early at the railway siding or roadside is the neglect to make allowance for the alteration of the sun's position as the day advances. A shady spot selected at 10 o'clock in the morning may be no longer shady at noon, and by the time the cream can is lifted by the railwayman or the cream carrier it may have been exposed to the direct heat of the sun for an hour or longer.

In many parts of Queensland extra attention to details is demanded by the exigencies of the climate and, in this, the efforts and care of each individual handling cream in transit becomes all important.

PALATABILITY OF FEEDS.

While the cost of the ration fed to dairy cows is likely to influence its composition, consideration should also be given to the palatability of the feeds selected. Nothing should be fed to the animals which will affect the quality of the product yielded. What is suitable for one animal may not be suitable for another, and the method of using stock foods governs their value. For producing animals—i.e., animals converting the food eaten into some product such as milk—it is essential that they should eat enough. In order to guarantee this sufficiency, care should be taken to ensure that the ration fed is wholesome and palatable.

Unless the ration is palatable, cows and fattening pigs will not consume sufficient food for the efficient production of milk and cream, and bacon. Unpalatable foods which have to be fed to milking cows should be used sparingly and mixed with some other well-liked feed. In this way, the bulk of the ration can be increased, the more palatable ingredients inducing the animal to consume the whole of the mixture. Roughage can be chopped and mixed with concentrates. The roughage often becomes softer, and the mixture more wholesome and appetising by mixing it with a dilution of molasses.

It is only by feeding rations of a palatable nature that the maximum production can be obtained from live stock. At the same time, it must be remembered that an important function of farm animals is to convert into useful products material which would otherwise be wasted. By keeping a watch on the materials at hand, it should be possible to dispose of practically all the feed available in a way which will ensure the best return.

AN IMPORTANT POINT IN CALF-FEEDING.

It is very important that calves should be fed separately. The practice of feeding the whole mob out of tubs or troughs must be condemned strongly, because it allows the fast drinkers to get too much milk at the expense of the others. It also tends to the formation of a bad habit. The young calves drink faster than they should, which causes a variety of digestive troubles. Slow drinkers grow best when they get their full ration of milk.

Proper pens or bails for calf-feeding are well worth the time or money entailed. Too often there is a complete lack of conveniences for this important routine job.

THE SEPARATOR FLOAT.

Probably the most neglected part of the separator is the float, the function of which is to regulate the flow of milk into the bowl.

This means that it should be perfectly balanced, otherwise an irregular flow occurs and inefficient separation and fluctuation of tests result.

It has been frequently found that floats are badly dented or leaking. To this condition is added the danger of throwing the float out of balance by unskilful repairs. It has also been found that leaking floats have been repaired without first emptying them, which makes them heavier than designed.

Probably the most serious aspect of damaged floats is the fact that cracks and badly soldered joints provide just the right conditions for the growth of bacteria. Consequently, milk passing over them becomes contaminated, resulting in many cases of cream being graded down.

Dairymen would be well advised to give consideration to this matter, and when repairs are necessary to have them done by a competent tradesman, who should be advised of the importance of the work.

PROTEIN AND MEAT MEAL.

Protein meal is a meat meal prepared from the clean edible portions of viscera of animals slaughtered, inspected, and passed for human consumption, together with carcases which have been rejected because of some fault rendering the carcase unsuitable for human food. The carcases of immature calves are also utilised for purposes of stock food manufacture. In process of manufacture of protein meal, a soft bone meal is added to the meat to assist in more complete treatment of the meal when passing through the grinding and seiving machinery. The whole mixture is then subjected to cooking at 60 lb. steam pressure for four to six hours, the time varying with the assortment of the charge (i.e., the mixture). Further heat treatment is then required to render the fat highly mobile for purposes of separation from the crackling (or remaining fatty fibrous matter). This treatment alone is sufficient to render the finished artcle sterile and free of risk from a disease point of view, hence protein meal is quite a safe product to use.

Meat Meal is a stock food prepared in a similar manner to protein meal, but the raw products consist entirely of livers and lungs from animals slaughtered and passed for human consumption. The carcases or viscera of animals condemned for tuberculosis are not used in the manufacture of protein meal, meat meal, or any other edible line, and hence there need be no fear of transmitting disease through use of these meals; but it is essential in storing them to keep them in a dry place where there is a strong draught of air, for this maintains the condition and prevents formation of mould and of objectionable odours.

PROFITABLE DAIRYING.

The first essential is to have every cow in the herd tested to make certain that she is worth keeping. As the animals must be adequately and properly fed, the next important factor is that governing production.

A good water supply is necessary. An ideal condition is, of course, sufficient water at convenient points in every paddock. Many dairy farmers, however, are satisfied with at least one good watering place. That means that if the herd is feeding at a distance from the water the cows do not go to the trough to drink as frequently as they would if it were closer to their grazing ground. On hot days it takes quite a lot out of animals to walk any distance, and when they do come in to water they stay in its vicinity. As the area surrounding the water is usually bare from over-grazing, they get very little to eat. So, in either case, the milk flow is seriously affected.

Another point which is often overlooked is the destruction of grass and herbage caused by the extra tramping of the animals going to and fro. Cows frequently destroy more feed with their feet than they actually eat.

Subdivision of paddocks will provide succulent pastures carrying a full complement of proteins, which the cattle relish and clean up as they proceed without tramping half of it into the ground. With pastures under complete control, the herbage and grasses can be fed off as required; and, in times of plenty, all surplus growths may be mown and conserved either as hay or ensilage.

The PIG FARM

The Breeding Sow.

EXPERIENCE has shown that sows having the benefit of succulent and nutritious pasture and plenty of daily exercise in the sunshine in clean paddocks, where they are undisturbed by other stock, are more likely to have big litters than sows which are continuously housed or confined to a small pen.

Keeping pigs in paddocks is satisfactory only where clean, warm, dry shelter sheds are available, in which the pigs may camp at night.

As the farrowing stage approaches, it is advisable to place each sow in her own individual yard or pen. The best time to do this is about three weeks before the sow farrows.

Sows housed together at farrowing time are likely to become quarrelsome, and any disturbance, particularly at feeding time, may result in abnormal births, if not in abortion.

Under open-air conditions and with succulent grazing, there should be little or no necessity for purgative medicines before farrowing. However, as individual animals differ in habits, and some are lethargic at this stage, a warm bran mash in which is mixed three fluid ounces of castor oil and just enough table salt to disguise the flavour of the oil will be beneficial, if given two or three days before the farrowing date.

Use of drastic purgatives should be strictly avoided, as the after effects are liable to bring on irregularities in the digestive organs. Careful control will do more than medicine or force in assuring satisfactory results. The food should be of a laxative, nourishing nature, and quantity should be strictly regulated according to the condition of the sow and litter.

SERVICE FOR PIG FARMERS.

Among the services provided by the Department of Agriculture and Stock for the man on the land is a comprehensive free advice service for pig raisers.

Pamphlets are available, on request, dealing with various aspects of pig-raising.

A free course of instruction by correspondence is available to anyone engaged in the pig industry. The lessons cover breeds, selection of stock, breeding, feeding, management, and marketing; plans of equipment and notes on pig foods also are included.

In writing to the Department for advice, full details concerning age of pigs, numbers, varieties, and quantities of foods used and type of piggery should always be included.

MAIZE AND PORK QUALITY.

Because of its relatively high fat content and the low melting point of its fat, maize can cause the production of soft fat in pork and bacon.

A sweeping statement is sometimes made that ''maize-fed'' pigs are soft as compared with pigs which have been fed on wheat or barley. The statement really needs some qualification so far as Queensland pigs are concerned. A large number could be classed as ''maize-fed,'' but they rarely receive sufficient maize to cause soft pork or bacon.

Maize is the most widely grown grain in Queensland, but the pig industry is not dependent on this crop. It is very closely associated with dairying, the pigs being used primarily to consume the milk by-products—separated milk, butter-milk, and whey. Pasture, forage crops, and root crops also form a large part of the diet of pigs on some Queensland farms, and the grains—maize, wheat, and barley—are really only used as supplementary foods.

These points should be born in mind when reading the advice of some overseas authorities, who state that maize should not constitute more than about 35 per cent. of the grain allowance of pigs. This may be sound advice under English conditions where pigs frequently receive a diet which is about 90 per cent. grain and which usually does not contain milk products, but under Queensland conditions, where the feeding systems are as stated, there appears to be little danger of pigs receiving sufficient maize to depreciate their carcase quality.

Most of the pigs produced in Queensland can be classed as ''milk-fed.''

CHARCOAL FOR PIGS.

Digestive efficiency in farm animals depends largely on their ability to grind their food well. Thorough mastication is therefore linked with ease of digestion. Some animals may eat food rapidly without ill-effects. Thus the domestic fowl swallows quickly, but it has a remarkable mechanism in the gizzard for grinding the food to a fine state for subsequent digestion and absorption.

The pig is not so well equipped as the fowl to handle rapidly eaten food, yet under most farm conditions fast eating is the rule. The pig can be helped to make better use of its foods in the following ways:—

(i.) By feeding easily digested material;
(ii.) By grinding the less digestible foods;
(iii.) By ensuring the animals sufficient feeding room;
(iv.) By arranging for some open grazing where the animals may eat at their leisure;
(v.) By feeding aids to digestion.

It is the last with which this note is concerned.

Charcoal and coke are extraordinarily cellular in structure and possess a great number of surfaces. At these surfaces rapid digestion of food can take place. By feeding either of them in powdered form, coarse lumps of food become coated with a film possessing an actively digesting surface.

An alternative and cheaper method is to throw coarse charcoal or coke into the pig sty and let the animals grind and eat as they feel inclined.

WEIGHT FROM THE WALLOW—MAKING PIGS PAY.

Tests carried out at the Texas Agricultural Experiment Station (U.S.A.) show that pigs provided with a clean wallow gained weight quicker than pigs without a wallow.

Ten pairs of pigs were used in a ninety-day test. One pig in each pair had access to a concrete wallow, and the other was kept away from it. All pigs were self-fed the same food in individual pens. The average temperature during the summer months when this test was conducted was 83 degrees F. All the pigs had access to shade.

The ten pigs which had access to the wallow made an average gain of 14 lb. more per pig, and required 10 lb. less feed per 100 lb. gain in weight than did similar pigs without access to the pig wallow.

On that evidence, the pig wallow certainly pays.

Registered
Hatcheries

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven	White Leghorns
A. F. Buchler, Milman	Pincrow	White Leghorns
J. Cameron, Oxley Central	Cameron's	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled	Rhode Island Reds
B. Cross, Apple Tree Creek, Childers	Spring Hill	White Leghorns, Australorps, and Langshans
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield	Woodville	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
W. Easson, Formosa road, Tingalpa	Grassdale	White Leghorns and Anconas
E. O. F. Eckert, Laidley	Laidley	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner	Australorps
Elks and Sudlow, Beerwah	Woodlands	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Grice, Loch Lomond, via Warwick	Kiama ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
S. W. Kay, Cemetery road, Mackay	Kay's	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird ..	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara ..	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	Australorps and White Leghorns
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels ..	Australorps
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, White Leghorns, and Brown Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
S. V. Norup, Beaudesert rd., Cooper's Plains	Norups ..	White Leghorns and Australorps
H. W. and C. E. E. Olsen, Marmor	Squaredeal ..	White Leghorns, Black Leghorns, Australorps, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central ..	Pennefathers ..	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View ..	White Leghorns and Australorps
H. K. Roach, Wyandra ..	Lum Burra ..	Australorps and White Leghorns
W. G. Robertson, Bilson road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa ..	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
J. Steckelbruck, The Gap, Ashgrove	Cosy Nook ..	White Leghorns and Australorps
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps
P. and K. Walsh, Cleveland ..	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Atherton ..	Weaver's ..	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby ..	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps
R. H. Young, Box 18, Babinda	Reg. Young's ..	White Leghorns, Australorps, and Brown Leghorns

◆

THE PURCHASE OF POULTRY.

At this time of the year, the upward trend of egg values tempts many beginners, and also persons who keep a few fowls, to increase their income from poultry by purchasing pullets or hens. The idea is fairly sound, but there are numerous pitfalls for the inexperienced buyer.

Assuming that the beginner sets out to buy pullets about four or five months old, it is only natural to expect that the quoted price will have an important bearing on the transaction. For instance, if pullets four to five months old are obtainable from one source at 6s. per pair and from another at 10s. per pair, the cheaper lot may be bought.

The inexperienced buyer seldom appreciates the necessity for paying the higher price, as the birds are of the same age and breed. It should be borne in mind, however, that there is usually a definite reason for the difference in the price, and that difference can be summed up in one word—quality. The cheaper birds may have been culled from flocks, as the result of their being backward or stunted in growth. Such birds cannot be expected to commence egg-laying at the normal time and be profitable. If they are culls as pullets, it is unwise to breed from any of them. They cannot return a profit, irrespective of the purpose for which they are used.

After allowing for feeding costs and a slight increase in egg values, it is unlikely that the more expensive birds will show any profit during their pullet year. It is quite probable, however, that they will repay their purchase price. At the same time, many of these birds should make suitable breeders, and their use for this purpose would be profitable.

Much the same applies in the case of hens. Cheap hens are usually unsuitable as breeders, whereas many breeding birds may be selected from the more expensive birds. The purchase of old hens is not good business, apart from their value as future breeders. Again, while the beginner may be able to distinguish a pullet before it begins laying, once production starts it is more difficult to separate hens which have just completed a moult and pullets which have been laying for a few weeks. It is also very difficult to distinguish between a hen that is fifteen months old and one four years old. This means that in buying alleged first-year hens the birds could be any age above that mentioned.

In such circumstances, it is advisable for the prospective buyer to inspect the flock from which it is proposed to make the purchase before parting with his money.

Agricultural Notes

After the Burdekin Flood.

IN the July issue of the *Cane Growers' Quarterly Bulletin* was published a description of the disastrous flood experienced in the Burdekin district early in April last. A selection of photographs, illustrative of the damage caused to farms, was also reproduced.

During a recent visit to the area, the writer was struck by the energetic manner in which the farmers were attempting to rectify the damage they had suffered, and in many cases fields which appeared hopeless earlier in the year have been graded for irrigation and planted even where 18 inches of surface soil had been removed. In other cases, heavy sanding of fields had necessitated extensive scooping and grading, and this has also been carried out successfully.

Plate 118.

A SANDED FIELD WHICH HAD BEEN SCOOPED AND PLOUGHED.—A thin layer of original soil has been brought up by the plough.

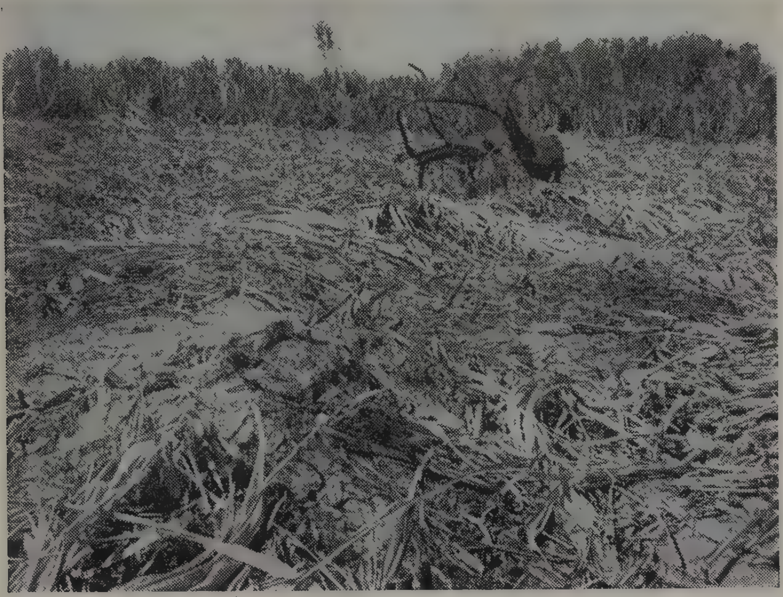

Plate 119.

ILLUSTRATING THE EXTENT AND NATURE OF THE SANDING EXPERIENCED IN CERTAIN FIELDS.—What remained of the mature crop had been harvested when the photograph was taken. The field has since been levelled and ratooned.

The illustrations printed here might be of interest to growers. Plate 118 shows a sanded field which has been scooped, and it will be noted that a deep ploughing has succeeded in bringing to the surface 2

Plate 120.

SHOWING A LUCERNE FIELD FROM WHICH THE FIRST CUT HAD JUST BEEN REMOVED.—The field received up to 12 inches of silt in April.

or 3 inches of the buried original surface soil. In cases such as this, it is recommended that alternate ploughing and scooping should be carried out, so that the land to which the sand is transferred will benefit from the admixture of surface soil which will be taken with it.

The second picture (Plate 119) illustrates the condition of a field of plant cane which was sanded and covered with flood debris. The crop had just been harvested, leaving, of course, a heavy tonnage of cane sticks buried in the sand, which was in places 3 feet in depth. The farmer has since graded the surface as well as possible and a profusion of "ratoon" shoots have developed from the eyes of the buried stalks. By means of discs, it has been possible to destroy most of those in the interspaces, so that it will be practicable to irrigate later in the season. It is confidently expected that a satisfactory ratoon crop will be harvested and, when ploughed out next year, the farmer can undertake the task of removing some of the sand, if necessary.

The third illustration (Plate 120) is a striking example of the benefits which some farmers experienced from silt deposits, following the flood. This picture was taken ten weeks after an earlier inspection when a deposit of silt 12 inches deep was just about ready for ploughing (*see* Fig. 19, *Cane Growers' Quarterly Bulletin*).

The field had been tilled, seeded to lucerne, and a first cut of this fodder removed in that short period. The hay cocks may be seen in the background, while on the left-hand side are seen the irrigation sprays applying water to ensure a second cut. This was taken five or six weeks later, and yielded about 1 ton of hay per acre.

H.W.K.

THE PLANTING OF SORGHUMS.

From time to time the Bureau of Sugar Experiment Stations has warned canegrowers of the danger of planting maize in cane areas where downy mildew disease exists, in conjunction with susceptible cane varieties. In these circumstances, the use of sorghums is strongly recommended; in fact, it is the experience of many farmers who have heretofore grown maize for fodder purposes that sorghums are much more reliable and satisfactory. There is no danger in feeding sorghum to stock, provided it has flowered. It should not be cut in its early green state.

Two major classes of sorghum are employed—(1) the saccharine or sugary types, such as Saccaline, which owe their food value largely to the sugary juice contained in the stems; and (2) the grain types, which concentrate food, in the form of starches, in the heads.

Seed of Saccaline can be obtained from most reputable seed dealers, while seed of the grain types are obtainable from the Department of Agriculture and Stock. The price charged is 4d. per lb., freight paid. At the present time seed of the following varieties may be obtained:—Kalo (recommended for the wetter districts), Hegari, Texas Black Hull, and Kaffir.

The seed may be sown broadcast (30 lb. per acre) or drilled at the rate of 4-5 lb. per acre. Drilling is recommended, notably for the grain types, as it assures the formation of better heads.

Plate 121.

Plot of Grain Sorghums, Meringa.

During the past season, very good crops of sorghum were seen in the southern cane areas, while good grain crops were obtained as far north as the Meringa Sugar Experiment Station.

H.W.K.

WHITE WASH WHICH LASTS.

Common limewash, made by slaking freshly burnt lime and diluting it with water, is often found to be friable when dry and rubs or flakes off rather easily. Effort has, therefore, long been directed to the discovery of a method of preparation which will make the coating more resistant to rubbing, less liable to flake off, and having some waterproofing qualities.

At the start, it should be said that a good deal of the flaking which occurs is due to new coats being put over previous applications which are practically already detached from their base, and merely require the slight "pull" caused by a succeeding coat to cause them to break. There is no known way of overcoming this condition other than removal by washing or scraping of the defective coating.

Ordinary limewash is made by slaking about 10 lb. of quicklime with 2 gallons of water. As an ordinary fixative, alum, 1 oz. to the gallon, will stop whitewash from rubbing off easily.

Flour Paste.

Alternatively, the addition of flour paste, which, however, needs the further addition of zinc sulphate as a preservative to prevent mildew, may be tried.

A reliable recipe for interior use (walls, ceilings, &c.) is:—

(*a*) 62 lb. (1 bushel) quicklime, slake with 15 gallons of water, and cover with sacking till steam ceases to rise. Stir occasionally to prevent scorching.

(*b*) 2½ lb. flour, beat up in ½ gallon cold water, then add 2 gallons boiling water.

(*c*) 2½ lb. common rock salt dissolved in 2½ gallons hot water.

Mix (*b*) and (*c*), then pour into (*a*) and stir until well mixed. This produces a mixture of good brushing consistency, and is used in factories, being recommended to prevent easy ignition.

Where a weatherproof coating for use out-of-doors is required, the following is a recipe which should prove satisfactory:—

Place 1 bushel of good fresh quicklime in a barrel with 20 lb. of beef tallow, slake with hot water (about 15 gallons added gradually so as not to "drown" the lime) and cover with sacking to keep in steam. When the lime has slaked the tallow will have disappeared, having formed a chemical compound with the lime. Dry earth colours (ochre, sienna, &c.) may be added before slaking if a cream or buff tint is desired. The mixture should be stirred occasionally, and thinned to easy-flowing consistency with clear water when cold.

"Lighthouse" whitewash, again suitable for exterior purposes, is made in the following way:—

(*a*) 62 lb. (1 bushel) quicklime, slake with 12 gallons hot water;
(*b*) 12 lb. rock salt, dissolve in 6 gallons boiling water;
(*c*) 6 lb. Portland cement.

Pour (*b*) into (*a*) and then stir in (*c*) and use at once.

Skimmed milk used in place of diluting water is sometimes advocated to increase the tenacity of the wash, and an old recipe for external colouring of farm buildings is:—Lime ½ bushel slaked with 1 gallon of milk and remainder of water; 1 lb. salt, ½ lb. zinc sulphate to withstand weather.

It has been found that an old cobwebby roof not easily accessible to brushing can be effectively cleaned by machine spraying with common limewash (well strained) which will bring the dust and cobwebs down, so that a second application produces a reasonably clean, white finish.

RIVER EROSION IN THE PROSERPINE DISTRICT.

The disastrous flood experienced in the Ayr district earlier this year was paralleled by a similar occurrence at Proserpine, where the river cut a new channel through its northern bank, and washed out a section of valuable cane land in the process.

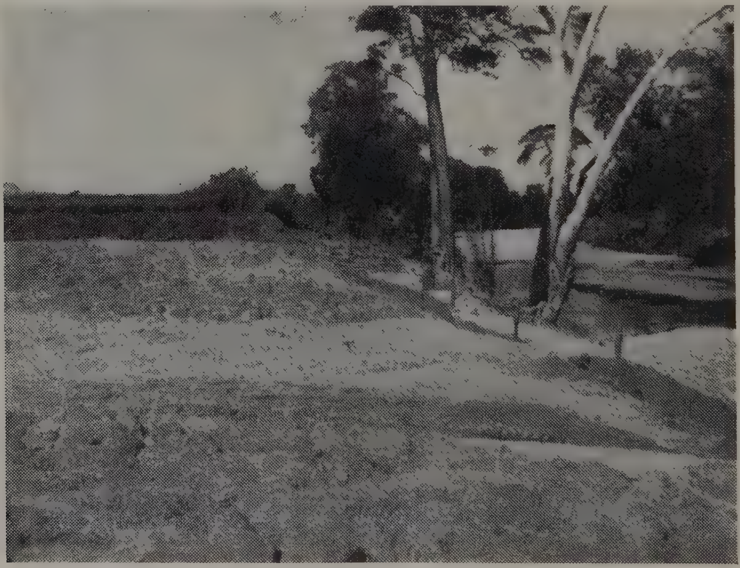

Plate 122.

Showing the Serious Break in the Proserpine River Bank Caused by Erosion during the Recent Flood.

The accompanying illustration (Plate 122) indicates the depth to which erosion has taken place. It is feared that successive floods may follow this new course, and farms which lie in its path will be endangered unless the breach can be repaired.

H.W.K.

A USEFUL HINT WHEN LAND GRADING.

Most farmers, when grading for drainage or irrigation, do not have access to a surveyor's level or other device to enable them to determine when they have scooped just sufficent soil to provide the surface slope required.

One Burdekin farmer has evolved a very ingenious method to provide him with the information he needs in this respect. He can determine accurately the condition of the surface, without any guesswork, merely by using two or three petrol or kerosene tins and an ordinary spirit level.

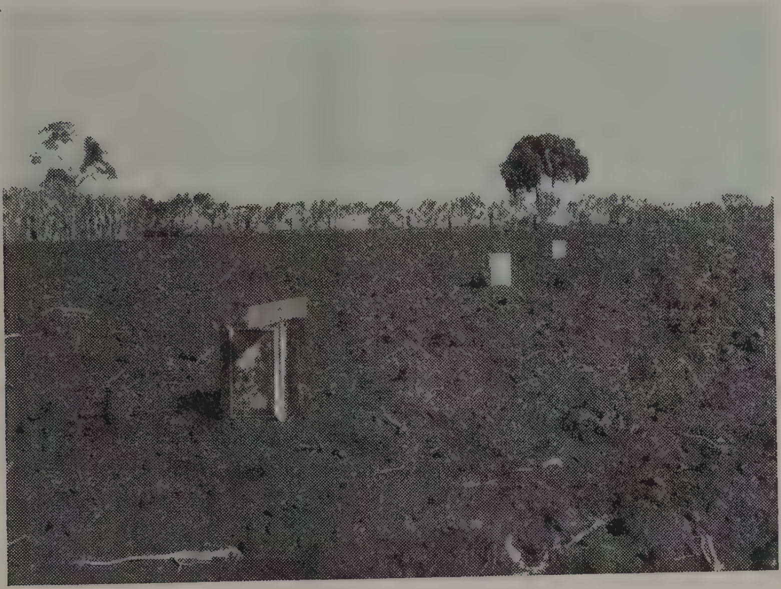

Plate 123.

Illustrating the Way in which Petrol Tins may be Used in Finding Levels.

The tins are set on the loose surface, as shown in the illustration (Plate 123) and by pressing lightly on one side or the other the top edge of the tin is adjusted until the level shows that it is horizontal. The remaining tins are similarly adjusted. Then by sighting along the top edge of the first tin, it may readily be determined whether the land surface falls away or rises, regularly or irregularly, as evidenced by the corresponding edges of the successive tins.

This little trick is both simple and convenient, as well as accurate.

H.W.K.

CLEANING PAINT TINS.

Paint tins and drums make handy containers about the farm when cleaned inside. To do this easily and thoroughly first remove all the paint that can be scraped out of them. Then set them in a tub of water with a weight in each to keep them down, and drop a lighted newspaper inside of each. The paint residue will ignite and burn away without melting the solder joints as the surrounding water protects them against excessive heat.

THE FELTED GRASS-COCCID.

A small, globular insect with a white felted covering is a widely distributed pest of grasses in pastures, lawns, and greens. Two insects of this type are well known, one being confined to nut-grass and related sedges, while the other has been recorded from a wide range of grasses including couch grass, buffalo grass, Para grass, Rhodes grass, red Natal grass, and Kikuyu grass.

The insect attacking various true grasses, and known as the felted grass-coccid, belongs to the mealybug group of scale insects. The adult female is brownish-purple in colour, globular in shape, and is enclosed in a white, felted, waxy sac which almost completely covers the insect. The female is attached to both the rhizomes and stems of grasses usually at the nodes where it is sheltered by the axils of the leaves. The numerical strength of the colonies is greatest close to ground level. The adult male insect is winged and is very rarely seen.

The eggs are retained within the body of the female until its death. On hatching, the eggs yield tiny active crawlers which leave the protective shell of the dead parent. They wander about on the plant stem or rhizome for one or more days and at this stage spread short distances from plant to plant. If the grass is uprooted the crawlers can be seen as minute, cream-coloured moving spots against the brown or green stem. When the young insect has found a suitable position for feeding, its long thread-like sucking tube is inserted into the tissues and sap is extracted as food. Thereafter it remains in the one position and, on moulting, loses its legs. The characteristic waxy-felt covering is then secreted by various glands on the body.

The number of times this life cycle recurs each year is at yet unknown, but there are probably two or three generations in the summer, followed by a period of very little activity in winter.

In view of its protective cover and sheltered position, the control of this insect is difficult and is normally necessary only when growing conditions are poor. Owing to the wide distribution of the species, eradication must be considered impossible.

In lawns, and more particularly greens, such as bowling greens, which are subject to close mowing practices, drains on the food reserves of the plant by innumerable coccids may cause wilting and browning of the grass. Every attempt should be then made to restore vigorous growth by top-dressing, fertilizing, watering, and, when possible, spelling the grass for longer periods between mowings.

Fertilizing treatment comprises firstly, the incorporation in the spring top-dressing of sulphate of ammonia at the rate of 3 cwt. per acre or 1 oz. per square yard of green, and secondly, watering the green in autumn with a solution of sulphate of ammonia at the rate of 2 to 4 oz. of the fertilizer per square yard.

When greens or lawns are heavily infested the following mixture, applied with a watering can, may be used.

1 fluid oz. nicotine sulphate.
1½ oz. soap.
2½ gals. water.

The soap, a good quality kitchen soap, should be shredded and heated in a small quantity of water to form a solution. This is then made up to 2½ gallons by the addition of cold water, and the measured quantity of nicotine sulphate is stirred in. This material can have no deleterious effects on the lawn and if applied so as to thoroughly wet the grass, will have a part contact poison, part fumigating effect on the insect. The fumigating effect may be increased by treating a section of the lawn and then covering it immediately for two or three hours with a large tarpaulin; an adjacent section can then be similarly treated. Crawlers should be killed by such treatment but some eggs may survive and a second application may be necessary.

Treatment of pastures is hampered by economic considerations and efforts should, therefore, be made to improve the vigour of the grass by orthodox methods, These may involve manuring, mechanical renovation or even pasture re-establishment after a short period of cropping. Details of such pasture improvement must be worked out for each district to conform with local requirements and can best be discussed with the resident instructor in agriculture.

Horticultural Notes

Summer Lettuce.

WHILE lettuce thrives best in the early spring and autumn, good grade summer lettuce can be produced on the heavy soils of the highlands where the temperature of the air and soil is moderately cool.

Lettuce, particularly at this time of the year, cannot stand a check, therefore an even supply of moisture and plant food must be available.

The preparation of the soil should include the digging in of a generous supply of farmyard manure. Besides supplying the necessary readily available food, this manure greatly assists in the retention of moisture and in keeping the soil cool.

As frequent waterings will be necessary, any extra time required for levelling the land will be well spent.

If the land is dry when the beds are formed, it will be advisable to thoroughly soak them before sowing the seed as it will be found that the beds are inclined to settle unevenly after the first watering.

The seed being very small should be sown as shallow as possible and covered with just sufficient soil to ensure germination. A top dressing of fine manure after sowing will greatly assist in the germination, seedling, and maturing stages. Very thick seeding, besides being wasteful, entails much additional work in thinning. Successive sowings should be made at intervals of ten days throughout the summer. The seedlings should be thinned before crowding takes place. Thinning is best done with a light hoe, blocking out the plants to approximately 12 inches apart in the row; further thinning by hand to one plant in any place may be necessary. To enable the plant to develop deep roots, over-watering at this stage should be avoided. More frequent waterings will be required as the plants increase in size.

Lettuce is a shallow rooter and a poor forager, and, therefore, well regulated waterings will do much to assist the growth of a strong deep-rooting plant. Over-watering is very damaging, and it will take some experience to tell just when the lettuce needs water. Generally, a tough appearance and a darkening of the leaf are symptoms pointing to a lack of water.

It is very important to select a variety for planting which grows well in the locality under consideration. Climatic conditions and market requirements also should be considered. In this respect both "Imperial F" and "Iceberg" are recommended.

WASHING OF SOIL IN ORCHARDS.

Surface drainage should be studied before laying out an orchard. In established orchards where it is found that surface wash and scouring is occurring, much can be done to prevent it. All surface water from above the orchard may be diverted by making a wide, shallow contour drain on the top side of the orchard, where the ground may be grassed. With a plough and scoop, this drain can be made usually at a very small cost. Depth and width will be determined by the volume of water to be diverted, but a drain about 4 feet wide and 18 inches deep, with the soil scooped on to the lower side, will do in most cases. This type of drain will not scour nor silt up readily, and if well grassed will need very little attention.

It should be remembered that a fall of 18 inches in every 100 feet is the correct grade for surface contour drains in a cultivated area.

To reduce loss of soil by the action of heavy rains on the cultivated areas, the planting of suitable cover crops should receive attention.

If it is not intended or desired to plant cover crops, it should be remembered that badly cultivated land with a hard pan near the surface will wash more severely than if good cultivation has been the rule.

Where the ploughing has been left in the rough it will be found that each furrow will carry its own water, whereas a final cross-ploughing tends to back the water up until it forcibly breaks through at a low point, generally causing a big run and considerable damage.

TOMATO MARKETING.

A comparison of tomato prices during the past season places the Southern Queensland output in a secondary position. There is strong reason to believe that this is influenced by (1) poor maturity of fruit, and (2) faulty packing. Another comparison shows that coloured fruit brings much better prices than green fruit. The question naturally arises as to why green fruit should be delivered when a higher price is obtainable for coloured grades.

No difficulty in marketing coloured fruit should occur until late in the season. By that time, supplies will have begun to ease off, enabling extra care to be taken. Growers may achieve a desirable maturity standard by picking only matured fruit, and packing to a colour standard, any green fruit being left in a cool place until fit for a later consignment.

Difficulties may be experienced on large plantations, but these may be largely overcome by appointing one of the workers as a special packer. Having everybody on the farm doing all sorts of work does not make any man an expert in any particular job. A specialist in any type of work becomes fast and expert, always doing better work than the jack of all trades.

In furthering the aim of better packing, free tuition is available to growers from the Department of Agriculture and Stock by applying to the Under Secretary.

TRANSPLANTING TOMATOES.

When tomatoes are transplanted during summer, considerable loss is often caused by the young plants ''burning off'' at ground level. This is particularly noticeable where the soil is fine or sandy.

A dull day should be chosen for transplanting, but if the area is large and transplanting cannot be postponed, it should be done late in the day. Roll the stem of each plant in paper just before planting. This is best done by having a sufficient supply of papers cut to a suitable size—for the average size plant, about 4 inches by 1½ inches. The papers may be threaded on a string and suspended from the belt of the field worker for convenience in use. On taking a plant from the carrying-box or basket, the paper is snapped off the string and rolled round the stem of the plant—like rolling a cigarette—leaving only the top leaves and the root exposed. The plant may then be placed in the ground in the usual way. It will be found that after a little practice very little extra time will be required for this method of planting. Other advantages of this method are that the young plant does not readily droop, and soon becomes established. Where cutworms are troublesome, it also will give a good measure of control during the early stages of growth.

THE FRUIT MARKET.

J. H. GREGORY, Instructor in Fruit Packing.

THIS month's notes are from the Sydney markets. Pineapples and tomatoes have been affected by the same set of conditions. Prices were as high as 15s. for pines and 18s. for tomatoes, but consumer demand suddenly dropped to the disadvantage of retailers who had bought at top values. A slow market for consignors was the inevitable consequence. The usual thing happened when the prices gained for early consignments became known. In efforts to be ''in on the big money,'' growers increased their deliveries, in some cases casting aside all sound marketing practices. Among the heavy pineapple consignments were green and badly graded fruit, and fruit which had been pulled and so subject to damage in transit. A ''dead'' market soon developed. In tomato consignments, smalls and B grade fruit were mixed and supplies accumulated. As some growers had not separated green from coloured fruit, within a week there were both green and over-ripe fruit in the same cases. It was just a recurrence of the age-old human failing of ''grasping at the shadow and losing the substance.'' Good, brisk, constant markets at medium prices are always more satisfactory than high peaks and steep declines in values. The higher the rise the harder the fall when the inevitable reaction sets in.

Some fine lines of papaws were delivered on the Sydney market. Stone fruits are coming in, and first Queensland consignments of mangoes are arriving. Only special classes and varieties of mangoes should be sent South. Towards the end of the month, late strawberries were still to be seen, but quality was poor. Many lines of partially-filled bananas were on offer to reluctant buyers. Good quality fruit of all kinds were selling well in Sydney, but low quality offerings were hard to quit.

Prices during the last week of October were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 4s. to 7s. 9d.; Sixes, 4s. 6d. to 12s.; Sevens, 5s. to 16s. 6d.; Eights and Nines, 8s. to 18s. Bunches, 1d. to 7d. dozen.

Sydney.—Cavendish: Sixes, 10s. to 12s.; Sevens, 12s. to 16s.; Eights and Nines, 16s. to 20s.

Melbourne.—Cavendish: Sixes, 10s. to 14s; Sevens, 13s. to 16s; Eights and Nines, 15s. to 18s.

Newcastle.—Cavendish: Sixes, 12s. to 14s.; Sevens, 14s. to 17s.; Eights and Nines, 18s. to 20s.

Brisbane.—Lady Fingers: ½d. to 10¼d. dozen.

Pineapples.

Brisbane.—Smooths: 6s. to 7s. case; 2s. to 5s. 6d. dozen. Ripleys: 7s. to 10s. 9d. case; 2s. to 7s. dozen.

Sydney.—10s. to 14s. early in month; now 8s. to 10s.

Melbourne.—9s. to 14s.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. 6d. to 5s. bushel; Locals, 2s. 6d. to 3s. bushel.

Sydney.—8s. to 14s. tropical case.

Melbourne.—9s. to 13s. tropical case.

Mangoes.

Brisbane.—8s. to 10s. bushel.

Sydney.—First lines arriving. No sales made.

CITRUS FRUITS.

Oranges.

Brisbane.—5s. to 8s. bushel.

Lemons.

Brisbane.—Locals, 8s. to 12s.; Gayndah, 14s. to 18s.

Passion Fruit.

Brisbane.—First, 14s. to 17s.; Seconds, 8s. to 12s.

Sydney.—14s. to 20s.

Melbourne.—18s. to 22s.

Strawberries.

Brisbane.—Boxes, 7s. to 10s. dozen.

Sydney.—Trays, 1s. to 4s.; Boxes, 6s. to 12s. Most lines poor in quality on arrival.

Apples.

Brisbane.—5s. to 12s.

MISCELLANEOUS, VEGETABLES, ETC.

Rhubarb.—Brisbane, 6d. to 1s. 3d. bundle.

Carrots.—Brisbane, 3d. to 1s. bundle.

Parsnips.—Brisbane, 9d. to 1s. 6d. bundle.

Celery.—Brisbane, 9d. to 2s. bundle.

Lettuce.—Brisbane, 6d. to 1s. 6d. dozen.

Peas.—Brisbane, 4s. to 7s. per bag.

Beans.—Brisbane, 5s. to 10s. per bag.

Pumpkins.—Brisbane, Old, 12s. to 15s. bag; New, 18s. to 20s. per bag.

Marrows.—Brisbane, 2s. to 6s. dozen; 5s. to 7s. case.

Cabbages.—Brisbane, 2s. 6d. to 9s. per bag.

Cucumbers.—Brisbane, North Queensland, 6s. to 10s.; South, 6s. to 18s. per bag.

Tomatoes.

Brisbane.—Coloured, 6s. to 8s.; Ripe, 4s. to 6s.; Green, 2s. to 8s.

Sydney.—Original packs over 2 inches, 5s. to 9s.; Smalls, 1s. to 4s., hard of sale; Ripe, 2s. to 4s.; Glasshouse to 14s.

PINEAPPLE MARKETING.

When the summer smooth leaf pineapple crop in South Queensland is ready for market, the necessity of packing only good class, matured fruit will demand renewed emphasis.

There is always the tendency with some growers to pick the first shipments of pineapples too closely, with the result that these consignments lag on the Southern markets, waiting for the necessary colour to develop. Subsequent consignments arrive on top of an already loaded market, and have the effect of reducing prices. Complaints that pineapples are arriving far too green and are consequently very hard to move on the market are very common. Such fruit never ripens into an attractive condition.

Pineapples for the Southern markets should not be picked until there is a distinct sign of colour at the base of the fruit. Only fruit left until this stage will develop into a good eatable commodity.

None but good-quality fruits free from suburn, mechanical injury, or insect damage, and which are reasonably assured of being free from water blister, should be packed. Packing with wood-wool is much preferable to grass; the pack always opens up cleaner and drier when the former is used.

Packing fruit to a nice grade is also a further factor in favour of a consignment. Any malformed fruit, or that which may have had the tops destroyed by frost, should not be packed. Cleanliness in the packing shed will keep the fruit free from most of the troubles which influence market valeus.

THE LATE ROBERT WILSON.

Tributes in Parliament.

IN the course of the debate in the Legislative Assembly on the estimates of the Department of Agriculture and Stock, fine tributes were paid to the public services of the late Robert Wilson, formerly Acting Under Secretary and Director of Marketing.

Hon. H. F. Walker, formerly Minister for Agriculture and Stock, said that the late Mr. Wilson was a public administrator of outstanding value. With unerring judgment he selected juniors for the job for which they were most suited by talent and temperament, and imbued them with his own enthusiasm for efficient and ungrudging service to the community. "We can ill afford to lose such a fine man; primary industry has suffered severely by his death" added Mr. Walker.

Hon. Frank W. Bulcock, Minister for Agriculture and Stock, expressed cordial appreciation of the references by the hon. member for Cooroora (Mr. Walker) to the late Mr. Wilson whose death occurred while the Minister was abroad last year. Continuing, Mr. Bulcock said: "I have worked with many men, and I say without hesitation or reservation that Mr. Wilson was one of the finest men I had ever had the pleasure of working with. He was a man to whom duty and service were paramount, and he is probably the ideal of many men in the Public Service. Certainly the inspiration he left behind has been a very potent factor in developing the Department of Agriculture and Stock. He had served in the Department for something like forty-six years, and saw it grow from infancy to adolescence and then to maturity. He was associated with all the big decisions made by the Department. There is one thing I did love above all else about the late Bob Wilson, and that was when a youngster came into the Department he always sought to find where his particular bent lay, and he always encouraged the youth and helped in the development of his natural bent. The loss of Robert Wilson will be felt as long as there are officers in it—and in other departments, too—whom he trained or who served with him."

These fine tributes in the Parliament of his native land were doubly earned by the late Robert Wilson as a front line soldier of the A.I.F. as well as a citizen "who in his time rendered great service to the State."

PRINCIPLES OF BOTANY FOR QUEENSLAND FARMERS.

A new book containing a fund of useful information about Queensland trees and shrubs, and of practical utility to the man on the land.

Price, 2s., Post Free.

Obtainable from—
The Under Secretary,
Department of Agriculture and Stock,
BRISBANE.

Plate 124.

A STAND-BY FOR STOCKOWNERS.—Florida Oshima Cow Cane in a departmental variety trial at Rockhampton. Yield 48 tons to the acre.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of September, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (STANDARD, 350 LB.).				
Sunnyside Mabel 16th	P. Moore, Sunnyside, Wooroolin	11,971·5	429·734	Countess Lad of Cosey Camp
Rosenthal Perfect 4th	S. J. H. Mitchell, Rosenthal	9,834·68	411·927	Ardendeuchar Admirable
Rosenthal Perfect 5th	S. J. H. Mitchell, Rosenthal	9,572·34	406·412	Rosenthal Carbine
JUNIOR, 4 YEARS (STANDARD, 310 LB.).				
Springlands Gentle	Mr. V. A. Wyvill, Yarralea, Upper Yarraman	10,614·75	413·734	Osiris of Greyleigh
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Alfa Vale Star 5th	W. H. Thompson, Alfa Vale, Nanango	12,328·9	502·974	Reward of Fairfield
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Rosenthal Maggie 17th	S. J. H. Mitchell, Rosenthal	6,368·97	264·021	Rosenthal Perfection
JERSEY.				
MATURE COW (STANDARD, 350 LB.).				
Golden Lady of Springvale	P. J. Neal, Peeramon	6,177·35	361·962	Prides Noble of Burnleigh
SENIOR, 4 YEARS (STANDARD, 330 LB.).				
Windyway Duchess	Wakefield Bros., Upper Barron, Atherton	7,281·5	417·155	Royal Emblem 2nd of Rosedale
Lucy of Windyway	Wakefield Bros., Upper Barron, Atherton	6,613·9	376·066	Royal Emblem 2nd of Rosedale
JUNIOR, 4 YEARS (STANDARD, 310 LB.).				
Calton Averier	W. J. Semgreen, Tecoma, Coolabunia	8,106·15	435·87	Laddie of Calton
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Windyway Melba	Wakefield Bros., Upper Barron, Atherton	5,269·35	338·575	Royal Emblem 2nd of Rosedale
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Windyway Crystal	Wakefield Bros., Upper Barron, Atherton	5,714·55	328·105	Royal Emblem 2nd of Rosedale
Lady Primula	E. G. Rothery, Ringarooma, Archer	7,038·95	310·191	Booser of Cooeeall
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Lermont Belette	J. Schull, Lermont, Oakey	5,269·2	303·783	Woodside Golden Volunteer
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Windyway Feather	Wakefield Bros., Upper Barron, Atherton	4,830·25	275·832	Royal Emblem 2nd of Rosedale
Ashview Essie	C. Huey, Ashview, Sabine	4,952·75	251·369	Martinville Duke

General Notes

Staff Changes and Appointments.

Executive approval has been given to the appointment of Messrs. H. McNee, A. F. Skinner, G. W. Smith, and E. W. Baird as instructors in Agriculture.

The appointment of these officers is in accordance with the established policy of the Department of Agriculture and Stock in recruiting its staff for extension services from students who have successfully completed a Diploma Course at the Queensland Agricultural High School and College. Messrs. McNee, Smith, and Baird hold the Queensland Diploma in Agriculture, and Mr. Skinner the Queensland Diploma in Horticulture. The appointment involves promotion from the position of field assistant, in which capacity they have served in the General Agriculture section of the Department for the required period.

Mr. W. A. McDougall, M.Sc., assistant entomologist, Bureau of Sugar Experiment Stations, has been appointed entomologist, Sugar Experiment Station, Mackay.

Mr. G. A. Christie, Q.D.A., field assistant, Bureau of Sugar Experiment Stations, has been appointed instructor (Sugar Cane Culture), Meringa.

Mr. L. F. Mandelson, B.Sc.Agr., research officer, Agricultural Section, Division of Plant Industry (Research), Department of Agriculture and Stock, will be transferred to Inglewood.

Messrs. A. D. R. James (Toowong) and J. G. Grant (Greenslopes) have been appointed honorary rangers under *The Native Plants Protection Act* and honorary protectors under *The Fauna Protection Act*.

Mr. D. Ryan, Acting Police Magistrate, Bundaberg, has been appointed an agent of the Central Sugar Cane Prices Board for the purpose of inquiring into sales and leases of assigned lands, during the absence of Mr. C. D. O'Brien, Police Magistrate.

Constable P. James (Meringandan) has been appointed an inspector under *The Slaughtering Act*.

Fauna Sanctuary at Drayton.

An Order in Council has been issued under "*The Fauna Protection Act of 1937*" declaring "Smithfield," the property of Mrs. R. G. Winten, Drayton, to be a sanctuary for the protection of native fauna.

Mr. D. J. Callaghan, inspector of dairies, Boonah, has been appointed dairy instructor, Department of Agriculture and Stock, Brisbane.

Mr. C. J. Payne, assistant, Sheep and Wool Branch, Department of Agriculture and Stock, has been appointed senior classer.

Mr. J. A. Franzman, Clerk of Petty Sessions, Babinda, has been appointed chairman of the Babinda Local Sugar Cane Prices Board and an agent of the Central Board.

Mr. A. H. Ashton, David avenue, Bardon, has been appointed an honorary fauna protector and an honorary ranger under *The Native Plants Protection Act*.

Mr. B. G. Scheuer, Yarraman, has been appointed an honorary protector of fauna.

Banana Industry Protection Board.

A Regulation issued under *The Banana Industry Protection Acts* provides that for the period up to and including 30th September, 1941, the two growers' representatives on the Banana Industry Protection Board, in lieu of election shall be nominated by the Committee of Direction of Fruit Marketing from its banana sectional group committee.

Messrs. W. J. Branch (Russell Island) and A. W. Chapman (Eumundi) have been appointed growers' representatives on the Board until 30th September, 1941.

Fig Levy.

A Regulation has been issued under *The Fruit Marketing Organisation Acts* empowering the Committee of Direction of Fruit Marketing to make a levy at the rate of 5s. per ton, and/or a proportionate part of 5s. for each part of a ton, on growers of figs delivered to canners on and from 1st December, 1940, until the 30th April, 1942. The sums raised will be expended only on advertising in the interests of the fig-growers concerned.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Caustic Creeper.

J.P.H.C. (Emerald)—

The specimen is *Euphorbia Drummondii,* the Caustic Creeper, a native of Western Queensland and the interior of Australia generally. This plant has at times been accused of poisoning stock, but at other times seems to be eaten with impunity. Most of the trouble seems to be with travelling animals.

In New South Wales the plant has been found to contain a prussic-acid-yielding glucoside, and to kill stock in the same way as young sorghum. In Queensland repeated tests have always yielded negative results, and the symptoms described by experienced stockowners have not been those of HCN (prussic acid) poisoning. All the reports that have come to us state that the head and neck of affected animals swell considerably. If this swelling is pierced an amber-coloured fluid exudes, and the life of the sheep may be saved. Dr. D. A. Herbert, when Government Botanist of Western Australia, found that experimental feeding on rats with Caustic Creeper produced the effect of swelling of the head and neck, as described by experienced stockowners in sheep. A similar condition is also reported as caused by the Bottle Caustic (*Euphorbia eremophila*).

Native Quinine.

M.R.I. (Rockhampton)—

The specimen is *Alstonia constricta* var. *mollis,* generally known as Native Cinchona, or Native Quinine. It is widely spread in Central and Southern Queensland from the coast to about 300 miles inland. It is sometimes eaten by stock, but is not known to have any fodder value. The plant, so far as we know, has not been suspected of causing losses in stock. It grows on a considerable range of soil, but favours sandy loam. Sometimes in such country it becomes rather of a pest in cultivation because of its habit of suckering. The plant contains the alkaloid alstonine, and has been tried as a substitute for quinine, but has been reported on by manufacturing chemists as useless in this respect. It has been used as a stomachic.

Cassia.

W.D. (Brooweena)—

The specimen is *Cassia bicapsularis,* a shrub native of tropical America. It is mostly listed by nurserymen under the name of *Cassia Candolleana.* We have not heard a local name applied to it. It is usually simply called "Cassia." It is a handsome shrub, usually propagated from seed, and has showy yellow flowers. It does quite well about Brisbane, and we have seen it in the South Burnett. In the Kingaroy district, however, we noticed it was very frost-tender. Nevertheless, it seems to come up from the old stump the following year.

A Native Couch Grass.

F.H.D. (Longreach)—

The specimen is *Brachyachne convergens,* a native couch grass. It is one of the numerous grasses known in the Central-West as "Star Grass." So far as we have observed, stock do not take readily to it, and we should say it is only of secondary value. The disadvantage of the grass is that it contains a prussic acid-yielding glucoside in large quantities. Some recent losses on a stock route at St. George were attributed to this grass. Ordinary paddock stock, so far as we know, are seldom affected by the plant. We hardly think it worthy of encouragement.

Regarding the use of Red Burr, Goat Head, and Saltbush for silage, we think the only one that would be feasible would be the last. We do not think the plants, on the whole, very serviceable.

Tree Nomenclature.

H.S. (State School Forestry Club, Kalpowar)—

Subjoined is a list showing the botanical names you require. Several of these names should be used with caution. For example, two different trees are commonly called Swamp Mahogany (*Tristania suaveolens* and *Eucalyptus robusta*). The name Plum is applied to several different trees, including *Sideroxylon australe* and Sandalwood (*Santalum lanceolatum*), as well as to the common Burdekin Plum. Similarly, several different trees are commonly called Apple. The name Pinkheart is also used for widely different trees. The name given in the list is the small tree growing in the scrubs (rain forests), which is also known as Bone Wood.

Blue Gum (*Eucalyptus tereticornis*).
Grey Gum (*Eucalyptus propinqua*).
Spotted Gum (*Eucalyptus maculata*).
Gum-topped Box (*Eucalyptus hemiphloia*).
Stringybark (*Eucalyptus acmenioides*).
Broad Leaf Ironbark (*Eucalyptus siderophloia*).
Narrow Leaf Ironbark (*Eucalyptus crebra*).
Golden Wattle, Queensland (*Acacia fimbriata*).
Black Wattle (*Acacia Cunninghamii*).
Silver Wattle (*Acacia podalyriæfolia*).
Creek Oak (*Casuarina Cunninghamiana*).
Mountain Oak (*Casuarina torulosa*).
Bloodwood (*Eucalyptus corymbosa*).
Plum, Burdekin (*Pleiogynium Solandri*).
''Flandosia,'' probably Flindersia is meant.
White Cedar (*Melia dubia*).
Red Cedar (*Cedrela Toona* var. *australis*).
White Myrtle (*Rhodamnia argentea*).
Black Myrtle (*Diospyros pentamera*).
Lignum Vitæ, native (*Vitex Lignum-vitæ*).
Tree Zamia (*Cycas media*).
Pinkheart (*Medicosma Cunninghamii*).
Grass Tree (*Xanthorrhœa*).
Yellow Jacket (*Eucalyptus* sp.).
Glasswood. We do not know this species. Could you send a specimen?
Ironwood, scrub (*Myrtus acmenioides*).
Ironwood Wattle is *Acacia excelsa*.
Hoop Pine (*Araucaria Cunninghamii*).
Supple Jack (*Ventilago viminalis*).
Cabbage Tree Palm (*Livistona australis*).
Bangalow Palm (*Archontophœnix Cunninghamiana*).
Brigalow (*Acacia harpophylla*).
Apple (*Angophora*).
Moreton Bay Ash (*Eucalyptus tesselaris*).
Crow's Ash (*Flindersia australis*).
Crow's Foot (*Tarrietia Argyrodendron*).
Bottle Tree (*Sterculia rupestris*).
Kurrajong (*Sterculia diversifolia*).
Cork (Native Corkwood is *Erythrina vespertilio*).
Pomegranate (Native Pomegranate is *Capparis*).
Fig (*Ficus*).
Weeping Willow, introduced tree along creeks is *Salix babylonica*.
Quinine, native (*Petalostigma quadriloculare*).
Sour Leaf, we do not know this species. Could you send a specimen?
Rose Apple (*Owenia venosa*).
Turpentine (*Syncarpia laurifolia*).
Mahogany (Swamp), (*Tristania suaveolens*).
Pepperina (*Schinus molle*).
Tea Tree (*Melaleuca*).
Coolibah (*Eucalyptus coolibah*).
Flindersia (*Flindersia*).
Milk Wood. We cannot be sure of this species from popular name only. Could you send a specimen to verify?

Blueberry Ash.

H.M. (Tewantin)—

The specimen is *Elaeocarpus obovatus*, the Blueberry Ash, a small tree worthy of cultivation, and very handsome both in flower and fruit. In the open it forms a very shapely tree, but in the scrubs and rain forests sometimes attains a considerable height, and is cut for timber.

Boonaree.

Inquirer (Brisbane)—

Your specimen is the Boonaree (*Heterodendron oleæfolium*), a tree very widely spread in Australia. It is very common in parts of Western Queensland, and is frequently fed to sheep without any ill effects. Like sorghum and some other plants, however, it contains a prussic-acid-yielding glucoside. Tests by the Agricultural Chemist show that the poisonous principle is at its maximum in the late summer months, and lowest in winter and early spring. It is an excellent fodder, but serious losses sometimes occur. Because of the presence of prussic-acid-yielding glucoside, it is a risky practice to feed hungry or starving sheep on the plant in great quantities. Ordinary paddock resting sheep are usually unaffected. It is a good practice to allow the leaves to wilt for a day or two before putting sheep on to them.

" Buttercup Bush."

H.E. (Yaraka)—

The specimen you forward is *Cassia Sturtii*, a native shrub for which we have not heard a distinctive local name. We have heard it called ''Buttercup Bush,'' because of its yellow flowers. We also have heard it called ''Turkey Bush,'' a name, however, applied indiscriminately to a number of plants in Western Queensland.

The plant is only superficially like the Heart-leaf Poison Bush (*Gastrolobium grandiflorum*), and is not known to possess any poisonous or harmful properties. If eaten in quantity it may have a purgative effect, as it belongs to the group of plants which produce the senna leaves of commerce. We have a number of native species of *Cassia*, and some are somewhat purgative in their effects on stock.

Western Grasses and Shrubs.

H.W.B. (Eulo, W.Q.)—

1. *Neurachne Mitchelliana*, Mulga Mitchell, or, preferably, Mulga Grass. Although sometimes called Mulga Mitchell, this grass is not related to the true Mitchell grasses. As the common name implies, it is often found associated with the Mulga, though not invariably. Sheep do not seem to be particularly fond of the grass, although it is usually eaten readily enough in drier times, and is generally regarded as a useful standby.
2. *Amphipogon* sp. aff. *strictus*, a grass for which we have heard no suitable common name. It is sometimes called Mulga Grass, but that name is more commonly applied to No. 1. Like the true Mulga Grass, it is very common throughout the South-West, but is not quite such a good fodder.
3. *Digitaria Brownei*, sometimes known as Silver-spike grass. This is quite a common species in the South and Central-West, more particularly where there are some trees, although it does occur in open grasslands. It is usually eaten freely enough.
4. *Eremophila longifolia*, Berrigan or Emu Bush. This usually does not grow beyond a shrub, or very small tree. Stock eat the leaves sometimes, and as the common name suggests, emus like the fruits.
5. *Eremophila Bowmanii*. This shrub belongs to the same genus as Nos. 4 and 6, but is not very common in Queensland, and consequently nothing practically is known about its properties. We have only had three or four specimens of this plant from Queensland localities before, and your specimen was of interest, and will be placed in our collection.
6. *Eremophila Gilesii*, Turkey Bush. This plant is quite a common shrub in parts of the South-West, and is particularly common about the Charleville district. It is generally left untouched by stock.
7. *Cassia eremophila*, a native Cassia or Buttercup bush, as it is sometimes called.
8. Bell Fruit (*Codonocarpus cotinifolius*), found in Western Queensland and New South Wales, An allied species sometimes comes up very thickly as secondary growth in coastal scrub areas. The tree which grows nearer the coast has much narrower leaves, but the same bell fruits as yours. ''Native Poplar'' is a name sometimes given to the tree, but we prefer the one of Bell Fruit.

Siris Tree. Carob Bean.

B.J.R. (Jundah)—

The specimen is not the Carob Bean, but is *Albizzia lebbek*, the Siris Tree, a native of India. It is now widely cultivated as an ornamental tree in some tropical and subtropical countries. In Western Queensland it is universally known as "Acacia." We have not known stock other than goats to eat the pods of this tree, but have passed your letter on to the Senior Instructor in Sheep and Wool (Mr. J. Carew) for an expression of opinion as to the suitability of the pods for sheep feed.

The Carob Bean, we do not think, is very suitable for Northern Queensland, as it likes a much cooler climate, and does best in Queensland on the Darling Downs. It has a very much fleshier pod than the Siris Tree, and the seeds are enclosed in a sweet sugary pulp. They are something like Tamarind pods, which you probably know, but in place of the acid flavour, have a sweet one.

Sarsaparilla. Bearded Grass.

M.R.M. (Mundubbera)—

1. The vine is *Hardenbergia monophylla*, commonly known in Queensland as sarsaparilla. It is not known to possess any poisonous or harmful properties and so far as we know has not come under suspicion before.

2. The grass specimen is *Echinopogon nutans*, Rough Bearded Grass. We were very interested in these specimens, as we had not received this grass from your district before. It is fairly common in parts of South-Eastern Queensland, and frequently grows on the edges of scrubs and similar places. We also were very interested in your notes on the palatability of the grass, and had not noticed stock eat it to any great extent.

Hairy Indigo. Canavalia.

C.P.L. (Burleigh Heads)—

The specimen is Hairy Indigo, *Indigofera hirsuta*.

Regarding the edibility of *Canavalia obtusifolia*, I might say that I have looked on this as somewhat harmful. The plant is, however, widely spread over the Pacific, and Mr. S. F. Kajewski, who did considerable botanising in the New Hebrides, told us that the natives there used the seeds regularly as a vegetable. We recently tried some out on pigs, as the plant is fairly common as a regrowth in some scrub areas, and the question is often asked whether the seeds can be used as pig feed. Tests with the beans, raw, showed they were unpalatable, but no ill effects followed their use.

Loblolly Pine.

R.B. (Pomona)—

Pinus taeda, the Loblolly Pine, is a large tree, 80-100 feet high, with a straight trunk 2-5 feet in diameter. The bark is bright red-brown, and the wood is largely used in the United States for interior work in buildings. The leaves are pale green, 6-9 inches long, and are borne in clusters of three. They are known as pine needles. The cone is oblong-conical to ovoid-cylindrical, 2-6 inches long, and composed of a number of scales. These scales are comparatively thin, rounded at the apex, and armed with short, stout, straight, or recurved prickles. The seeds are ¼ inch long with a pale brown lustrous wing. The tree is a native of South-Eastern United States of America.

Regarding observations you could make on the growth of the trees from time to time that would be of value from a forestry standpoint, you are advised to write to the Secretary, Forestry Sub-Department, Executive Buildings, Brisbane.

Rural Topics

Chemurgy.

Boiled down, chemurgy means the bringing of industry together through the medium of chemistry.

Here is a recent example of what has been done through what is called the chemurgic movement in the United States. Before the war, America imported practically all its cigarette paper from France where it was made from linen rags. Linen, of course, is made from flax. The blocking of their French sources of supply by the war placed American cigarette manufacturers more or less in a cleft stick, so they set about looking for substitutes for the accepted raw material for cigarette paper making. A lot of flax is grown in the States, and as linen is made from flax, one large cigarette paper importer put the chemist on the job of finding out what could be done with flax fibre. The search for a linen rag substitute was successful, and before long a new industry was established with modern paper mills working round the clock.

The agricultural background of flax production was studied in various parts of the country, and it was found that flax straw could be made into top-grade cigarette paper, and, therefore, added as a new cash crop for farmers. This single enterprise now employs 900 people, and provides a striking illustration of farm chemurgy possibilities.

New Industrial Products from Farm Waste.

And talking of chemurgy—that is the practical co-operation of the farmer, the industrialist, and the man of science in finding new uses for surplus products or waste crop residues—this new branch of science is making great headway in the United States. New markets for farm surpluses are being established through applied industrial science, and these new discoveries are as yet only in their infancy, and they are certainly bound to be of benefit to the farmer.

For example, more than twenty-five important industrial products are now being made from cornstalks, including bedding for stock, building blocks, cellulose, charcoal, diabetic food, dynamite absorbent, guncotton, timber substitutes, oxalic acid, and wallboard.

How the Merino Breed of Sheep got its Name.

The question is often asked—How did the merino sheep get its name? Well, as far as we can find out, the term ''merino'' comes from the word ''moedino,'' signifying wandering, and is the name of an Arab tribe who wandered from place to place in season with their flocks; and the more a sheep of this particular breed wanders about in quest of pasture, the better and more valuable is the fleece it grows. We usually give the credit for the virtues of the merino to France or Spain, forgetting that in the fourteenth century an English princess, Catherine of Lancaster, was engaged to the heir to the Castilian throne. The dower of a royal bride was a very important matter in those days, so the parents of the English girl, the royal bride to be, gave her as a wedding present a flock of sheep, and it was these sheep which, judiciously mated with the Spanish flocks, produced the now world-famous merino sheep.

The Goat Becomes Respectable.

It has taken a war with a possibility of invasion to give the goat its proper place in rural economy in Britain. We all know what the goat means to domestic menus in parts of Queensland—especially mining centres—where it is not always possible to keep cows.

A movement is growing in Britain to make the goat more popular as a milk and butter producer. For some years much interest has been taken in the keeping of certain noted goat breeds, and they have always formed a numerous, and in many respects, an interesting class at all the principal agricultural and stock shows in the United Kingdom, and the development of goat breeding from a milk-producing standpoint has resulted in some extraordinary milk yields being officially recorded. It is felt in Britain that small landholders might easily supplement their milk and butter requirements by the keeping of a goat whose cost of maintenance has proved to be negligible.

Driving Posts with Dynamite.

When we have to put a pile or a post in water or wet ground and a pile-driver is out of the question, we usually have to do a bit of hard thinking.

The Engineering Division of the United States Forest Service has worked out a new way of doing the job with dynamite. Dynamite, it has been found, can transmit a blow somewhat similar to the dropping of the "monkey" on a pile-driver. The post or pile is stood upright in the position in which it is required and braced in place—usually with a rope. The head of the post should be sawn off square, and then a heavy plate of steel put on top of it. To get the best results, the plate should be an inch to an inch and a-half thick. A stick of dynamite is placed on top of the plate and covered with mud, after the stick has been properly primed with a blasting cap and fuse. When the charge is exploded the force is transmitted to the plate which in turn transmits it to the pile. The pile is driven into the ground sometimes as deep as 14 inches, if the ground is soft. The procedure is repeated until penetration is reduced to an inch with every explosion. It is advisable to have about 4 feet extra length on the post, which can be sawn off after complete penetration is obtained.

There is nothing cheap about the method, especially if a pile drive can be conveniently rigged. Still, in some circumstances, it would be a good wrinkle to know. Of course, dynamite is tricky stuff to handle, and the utmost care should be applied to its use at any time. The experienced man would not want any advice on that score. The inexperienced man had better stick to the pile-driver—whether maul or "monkey."

The Biggest Bullock.

Here is something which will interest cattlemen:—

Recently a bullock was slaughtered at Southend, near London, weighing a ton and a quarter (2,800 lb.) after purchase by the British Government for £70. A claim is made that it was the biggest bullock in the world. That is true to-day, perhaps, but it does not compare with the historic "Durham Ox," which was calved in England in 1796, and which in its prime weighed a ton and a-half, or 3,360 lb. And that is a reminder of more recent instances of great weights of cattle. A Hereford bullock at Maidstone, in Kent, England, in about 1900, weighed 27¾ cwt. or 3,108 lb., while in 1915 a bullock known as Pat the Giant was slaughtered at Leeds and weighed even heavier than the famous "Durham Ox" at 3,558 lb., the carcase weight being 2,128 lb., or nearly 60 per cent. of the live weight. A bush-fed bullock that had never been handled, and which weighed 3,042 lb., was exhibited in Adelaide, South Australia, way back in 1894.

Many a big bullock has been bred in Queensland cattle country—the big-framed heavyweights that used to be yarded on Barambah and trucked at Goomeri will be remembered—and local records would be interesting.

A Word on Kudzu.

Kudzu, a plant which is interesting many Queensland farmers, has so far been rather difficult to grow in this State, although actually not very extensive trials have been made. Probably, if greater attention were given to it, it would grow well. Where it has been established in Queensland it has earned a high reputation as a fodder and as a soil-binder. American experience is entirely in its favour. Kudzu was brought to the United States about fifty years ago.. Commonly called a "porch vine" it has been transformed into an important field crop in the south-eastern districts of the States. Since the beginning of erosion control over there, more than 40,000 acres have been planted with this once ornamental plant.

One important thing about Kudzu is that it is not seriously affected by drought. It will not grow well, however, on poorly-drained areas of acid soils or on low, boggy land. The plant sheds its leaves every year; it is a viney legume which grows rapidly during spring and summer. Kudzu restores fertility to the soil by adding nitrogen and organic matter, and it maintains a stand over long periods without yearly soil preparation and planting. It grows vigorously on eroded land after it is well established and with dense ground cover it protects the soil against beating rains. Not only is Kudzu suited especially for the reclamation of badly-washed slopes in cultivated paddocks, but it also produces a palatable hay and forage of excellent quality; its feeding value is said to be as high as lucerne and it produces heavier yields than most annual plants grown for hay. Kudzu can easily be got rid of; so there is no likelihood of its ever becoming a pest.

The War and Agriculture—What Americans Think About It.

A warning has been issued to the American nations—that is, of both North and South America—that they should start preparing now for adjustments and reconstruction that will follow the war.

The present European war is regarded as of such dimensions that it must be expected to have far-reaching consequences for the farmers of the countries of both North and South America.

On this subject it is well to remember what happened after the last war. Conditions then arose that were, to a great extent, the cause of the gravity of the agricultural depression which set in about twelve years ago. The danger of a similar development during and after the present war must, it is felt, be seriously considered. The dislocation of international trade in primary products that has so seriously affected agriculture the world over in recent years left agriculture in a weakened position at the outbreak of the present deplorable war.

While the war may lead to temporary advantages in certain branches of agriculture, its long-time effects may outweigh the monetary gains and will undoubtedly aggravate social and economic conditions in agriculture. Now is the time to plan post-war readjustments so that whatever happens we shall at least be prepared for altered conditions in international relations.

A Plan for Standardising Agriculture.

A move for the standardisation of Australian agriculture is gathering way in all the States. The need of planned development in the interests of national security is now generally recognised. For a standardised agriculture it is claimed that it would mean extended and better markets at home and abroad and it would be especially valuable to the primary industries supplying the export trade. A nation-wide standardisation plan, it is said, would ensure quality, uniformity of quality, and continuity of supplies.

Planned Production.

A lot has been said lately of planned production, and it is just as well for us not to lose sight of its necessity. There is not the slightest doubt that all the wool, butter, bacon, meat, and other foodstuffs that we can produce will be wanted during the next phases of the war. The facts of the position are as plain as a rate notice. Production has to be maintained and extended at the greatest possible pitch of efficiency. Whatever may be the future policy, it should be possible for us to assess the export requirements of Britain and the facilities for production in this country. The object, as in every other industry, should not be profits, but the greatest benefit to the Empire effort.

In this, as in every other endeavour, our watchword is "All in."

A Word for Old "Bluey."

As every bushman knows the working dog is one of the best helps for anyone looking after stock, whether it be on the station, farm, or stock route.

It is a peculiar thing, but all the most successful dog men are quiet chaps who never get hot, bothered, or bustled when working a dog. They look after their dogs, feed them well, talk to them when they think they need a little attenution—and what dog does not? Lots of them who make their living droving, as well as otherwise working stock, too often neglect to give their dogs a fair spin. How often have stockmen been seen to starve their dogs and then expect them to turn out day after day, mustering and yarding sheep at shearing time, or dipping time, with scarcely a decent feed! No dog can work properly without feeding; the dog that is underfed never has the strength to see the day out at top speed—the stamina isn't there.

Most drovers look after their dogs well, knowing well that half the trouble with dogs will disappear with good feeding. If meat is scarce bread dipped in fat will do for a day or two. And then as to treatment: We all know stockmen who have never given their dogs a hiding in their lives, yet do some amazing things with them when working stock in the paddock or along the road, and it has been done just through kindness and keeping their dogs fit and in good spirits.

To see a good dog at work among stock is a delight; so let us pay for it with a pat on the head for "Bluey" or "Scotty"—and a "banjo" of mutton.

Harmony in the Cowbail.

Believers in the efficacy of musical milking have made another convert. Here is what a farmer writes to *The New Zealand Farmer Weekly*:—

"I used to regard this musical milking theory as almost as much as a fairy story as the good old-time theory about running a billy goat with a dairy herd if you wished to avoid calving troubles. I have found so many practical dairy farmers with radios installed in their milking sheds in recent years, however, that I have come to appreciate that it must be a sound practice. One farmer in a neighbouring district even went as far as to assure me that if the radio were switched off for any reason his cows would miss it and start to play up."

There is a suggestion in that as to how our budding Melbas may become immortal—in the cowbail.

Australian Timbers for War Industries.

The value of Australian timbers is being demonstrated by increasing use in war industries. The milling industry alone produces timber worth about £7,000,000 per annum in peace time, and this is the raw material for industries, products of which are worth many times this sum in war time.

The housing of the troops in camps consumes enormous quantities of timber in the structure of huts. Army transport wagons of all types, artillery wheels, construction of air raid shelters, and numerous other war activities all need timber in great variety and in large quantities.

Rifle stocks alone need an enormous quantity of timber. At one time, walnut was considered the only timber for this purpose, but Queensland maple and scented satinwood of New South Wales have both proved to be quite satisfactory for this purpose.

Again, all munitions have to be transported in boxes, and there is a large factory manufacturing tens of thousands of cases of all shapes, sizes, and colours to meet this army need.

Switching over from peace to war conditions has brought numerous problems in the need to replace imported timbers for special purposes by local timbers, where this is possible. When walnut became scarce, Australia had to find another timber, and, as has been stated, two such timbers have been found suitable.

In aircraft construction, spruce has been practically the only timber used for solid members and birch for the plywood parts. Research at the Division of Forests Products of the Council for Scientific and Industrial Research has already found substitutes for both these timbers, and this work is proceeding at high pressure to find still others so as to ensure plentiful supplies for all aircraft needs. A greatly increased staff is at work two shifts a day to provide all the data necessary for aircraft designers.

It will be realised that the greatest care has to be taken in such work. Tens of thousands of tests are being carried out, and they cover a great number of specimens from a large number of trees for each species tried. Aircraft designers need the fullest data before they dare substitute one timber for another. There are already sufficient data to enable the specifications to be written so that the specially selected timbers which have so far passed the tests can be purchased. A fully equipped small-scale factory has been built to enable the Division to cut its own veneers and make these into plywood for testing.

Another direction in which the Division's work has been carried out is the fireproofing of timbers for naval construction and for certain types of munition boxes. A plant designed by the Division is being erected in Sydney for this purpose.

Innumerable industries all over Australia find themselves in difficulties, because of inability to obtain timbers which they have been used to employ. Many of these have undertaken contracts in connection with munitions supply. They naturally turn to the Division for help in obtaining substitutes, and this frequently needs considerable experimental work.

Timber for match splints, golf heads, egg boxes, tennis racquets, boat decking, wheels for spinning mills, and scores of other purposes all need to be investigated. Very rarely, indeed, does it happen that a suitable Australian substitute cannot be found, although at times it is not easy to find a ready supply for special requirements.

Behind the brief reports setting out in practical terms the results which can be put into immediate use in industry lies an enormous amount of patient investigation by a staff of over 100 trained workers, some of whom are engaged in the more scientific inquiries and others in translating the results into actual factory practice.

Farm Notes

DECEMBER.

EARLY-SOWN crops of sweet sorghums, Sudan grass, millet, and maize, intended for fodder purposes, will now be in an advanced stage of growth where seasonal conditions have been favourable. Every effort should be made, where practicable, to conserve any surplus growth in the form of silage, hay, or stover. Trench, pit, or stack silage is recommended as economical and profitable means of conservation where an overhead concrete silo is not available. However, it is the autumn-harvested crops which usually provide the greatest bulk of conserved fodder, so December sowings of suitable bulky summer fodder crops are best for that purpose.

In localities where lucerne does not make satisfactory growth, the cowpea will often provide an alternative protein-rich fodder, besides being a valuable rotation crop of benefit to the soil. Cattle will not take readily to green cowpea, preferring the fodder in an advanced stage of growth, but once accustomed to it they will graze freely on it.

Sowings of main-crop maize will be continued during the month where conditions are suitable, utilising late-maturing varieties such as Improved Yellow Dent; but in districts where early frosts are experienced, the mid-season or early varieties are preferable.

Buckwheat is recommended as an early maturing alternative fodder crop, or as green manure where it is desired to plough under within six to eight weeks. Besides being a good fodder, buckwheat is valued as a bee plant, while the seed makes excellent poultry feed. Wheat-harvesting will be practically finished this month. Growers are, therefore, advised to give the land a preliminary working immediately after the burning or grazing of stubble in order to conserve succeeding summer rains. Even where the land is too hard for adequate ploughing, a light working with disc cultivator or sundercut will be found very beneficial.

Experience in recent years has proved that adequately summer-fallowed land invariably produces profitable yields.

December is usually a busy month, because of successive sowings of fodder and grain crops and the scarifying of row crops already established.

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THE CALL FOR MORE MIXED FARMING.

The necessity of meeting war needs and adjusting our systems of farming to changing conditions—marketing and otherwise—has strengthened a call for the consideration of the advantages of mixed farming. It is extremely hard to forecast what will be the greatest needs of the British Commonwealth, even in a few months' time, but it looks likely that animal products—butter and cheese, bacon and eggs, and, possibly, beef and mutton—will be the most valuable contribution to the Empire effort.

The informed view is that those farmers who are looking for some direction as the best way to use their land would find it most economic and of the greatest service to continue along the lines of production for which they are sure their land is most suitable, and to increase their proportion of live stock. Mixed farming is actually the middle course in present circumstances, and through practising it we avoid to some extent—possibly to a large extent—the risk of either over- or under-production of any specific commodity.

Even before the war broke out there was a definite trend to more mixed farming. Because of low prices, specialised wheat production—particularly in the other States of the Commonwealth—has become precarious economically, and now grain growers, who were one-crop men, are now turning to sheep and are finding out the value of wheat and sheep as a profitable combination.

In Queensland mixed farming is probably more generally practised—proportionately anyhow—but circumstances may compel a much wider extension of the system.

As has been said frequently that after the war there is certain to be intensified competition in world markets, which will compel restriction of Australian exports to products of uniformly high quality with guaranteed continuity of supply. For one thing, that means, of course, general conservation of fodder, for if our animal products are to be of the desired quality fodder must be kept up to producing stock.

Orchard Notes

DECEMBER.

THE COASTAL DISTRICTS.

PLANTING of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young, they take a long time to recover and consequently the fruiting period is considerably retarded.

Citrus orchards require constant attention; the land should be kept well worked and all weed growth destroyed. Spraying for scale insects should be done where necessary.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and lemons will be in season during the month.

Examine potatoes and tomatoes for Irish blight, and melons and kindred plants for downy and powdery mildew. Use bordeaux or burgundy mixture for Irish blight and downy mildew and sulphur dust or lime sulphur spray for powdery mildew.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY-ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle. The season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. Early ripening fruits should be carefully graded for size and quality, handled and packed with great care, and nothing but choice fruit sent to market.

Orchards and vineyards should be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later-ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, unless, of course, there is a good fall of rain in the meantime.

Codling moth and fruit-fly regulations should be observed strictly in order to keep these pests under control, otherwise the later-ripening fruits are likely to be attacked severely by these pests.

* * *

AN INTERESTING ORCHARD TOOL.

A three-row disc furrower, fitted with a power lift, is now in use in Californian orchards. The double discs throw the loose earth to either side, making the furrow in the firm soil deeper than the usual furrow. It is said that this practice helps to prevent the small particles from settling to the lower limits of cultivation, rendering a hard "pan" under the ploughed surface of the soil less likely.

A feature of this new implement is the direct vertical lift. Ratchet bars engage the idler wheels, thereby making a quick and positive lift. A similar tool equipped with skids, which trail in furrows to prevent sliding when furrows are being made on hillside orchards, has also been devised.

Plate 125.

Amid Pleasant Surroundings.—Cane farmers listening to a lecturer at a field day at the Meringa Sugar Experiment Station.

Plate 126.

Brazilian Lucerne, showing Promise as a Pasture Legume.

THE HOME
and
THE GARDEN

Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

THE CARE OF YOUR CHILD.

VOMITING AND ITS CAUSES.

Last month in our article on ''Your Child and the Approach of Summer'' we mentioned the danger of the onset of diarrhœa. We dealt with its causes, prevention, and treatment. This month we are going to speak to you about vomiting.

ONSET OF AN ILLNESS.

Vomiting is a common symptom of illness in childhood. It may occur at the onset of any fever, such as measles or even the common feverish cold.

POSSETTING.

By this is meant the returning of a little of the food without effort shortly after feeding. This occurs in a normal healthy breast-fed baby and means that the amount of food taken is slightly in excess of the baby's needs. It may be due to the expulsion of a little ''wind'' resulting from the air which baby has swallowed while feeding. Possetting is not really vomiting. Babies who are possetting are often thriving well.

VOMITING DUE TO FAULTY METHODS OF FEEDING.

Over-feeding..

In vomiting, the contents of the stomach are expelled with some force. While in natural feeding the amount taken at each feed by the normal baby varies, the child who persistently overfeeds is liable to suffer from a digestive upset sooner or later, particularly during the hot weather. The greedy baby may take not only more than he needs, but he may gulp his food. In some cases the stomach is unable to deal with the excess, its walls become irritated, and vomiting occurs. Once an upset of this sort occurs the stomach may take a little while to recover, boiled water may require to be substituted for one or two feeds and less food will require to be given for a time. Signs of overfeeding may be evident before an actual upset occurs. If the baby seems uncomfortable, is gaining weight rapidly, and is passing large, firm curds in the motions, often accompanied by slime, it is well to shorten his feeds at least temporarily. If you are in doubt seek the advice of a Child Welfare nurse.

In regard to the artificially fed baby, the hole in the teat may be too large allowing the child to feed too quickly. In some cases, even when a teat with small holes is being used, a greedy child may get his food too quickly. In the early months a baby often requires twenty minutes to take his food, as he becomes older and stronger he may get what he needs in half this time.

Under-feeding.

Vomiting occasionally occurs as the result of underfeeding. The child is hungry, and in his attempts to satisfy himself he sucks in air. This may be expelled later with some food. In this case although the motions may be frequent they are very small.

Sudden Change of Food.

Changing food suddenly may cause vomiting whether it be changing from one food to another or from one strength to another. All changes should be made gradually.

Faulty Composition of Food.

There may be excess of one or other of the food constituents. Excess of fat in the food of the artificially fed infant may cause vomiting. Excess of sugar also may cause vomiting, but more frequently it causes diarrhœa.

Feeding with Stale or Sour Milk.

Milk which is slightly sour will readily cause vomiting in an infant. Souring of milk is brought about by the action of germs which produce lactic acid. These develop more rapidly in hot weather. They are killed by boiling, therefore boiled milk does not sour. Boiled milk may be contaminated by disease producing germs, hence, the importance of exercising the care about which we told you in our article last month.

Vomiting Due to Infection.

Vomiting may occur as the result of the child's swallowing milk or other food which has become infected by germs of disease, such as in dysentry and other forms of infectious diarrhœa.

Careless Handling of the Child.

Vomiting may be caused by careless handling, such as jogging or patting the baby after his meal. After sitting him up in order to allow him to ''bring up the wind,'' he should be allowed to lie quietly after feeding.

Vomiting Due to Over-excitability.

This type of vomiting usually occurs in the first few months of life in infants who are in a state of nervous irritability and unrest. The infant is usually thin, over-exciteable, and precocious. He cries a great deal and sleeps less and more lightly than the average child. The mother herself is often ''highly strung,'' but if she is not she tends to become hypersensitive, worried, and irritable as the result of trying to manage this type of child. Vomiting of this kind occurs irrespective of the kind of food and is often seen in breast-fed infants. It may occur after every meal, and is prone to follow any nervous upset. Owing to the mother's state of anxiety and worry, her milk supply may be diminished and the infant may fail to gain weight. The motions appear normal, but they may be frequent and small if the child is underfed. In managing a child of this sort, attention must be directed not so much to the vomiting as to the underlying nervous state. Any form of excitement must be avoided. The child should be fed in a quiet room away from others in the household. Sometimes it is advisable to darken the room. It may be necessary to compose the child before feeding is commenced. Breast feeding should be continued. As the child's power of concentration and sustained effort is diminished, it may be advisable in some cases to give shorter feeds more frequently, say, at two-hourly intervals. It is the amount of food which is retained which is important, not the amount taken. There is no need for anxiety while the infant is gaining weight. The mother should not undertake the weighing herself, but should attend, if possible, a Child Welfare Centre, or obtain the services of a "welfare trained nurse" for her own sake, as well as for the sake of the baby. With patience and skilled management the infant will eventually recover. His nervous, over-excitable state may require careful handling for a long time after the vomiting ceases.

Projectile Vomiting.

There is a type of vomiting which occurs most frequently in a baby boy when he is about three to six weeks old. It is due to an obstruction to the passage of the stomach contents into the bowel. Often the child is breast-fed, and the vomiting sets in suddenly without other signs of illness. The vomiting in this case is of a particular character. The vomited material is expelled with considerable force and may come through the child's nostrils. If he is lying on his back it may lie in a pool beside his head, or if his face is turned to one side it may be projected on to the floor some feet away. The nature of the vomiting is usually sufficiently alarming to make a mother seek medical advice. We recommend her not to delay, for by early treatment the condition may be prevented from developing into a serious one.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N.1, Brisbane.

IN THE FARM KITCHEN.

PEACHES FROM STANTHORPE.

Peaches may be delicious additions to any meal, and here are some new ways of serving them:—

Peach Junket.

Take 3 ripe peaches, 1 quart milk, ¼ lb. sugar, 1 junket tablet.

Soak and remove the skins from the peaches and place them in a glass dish. Dissolve a junket tablet in a tablespoonful of cold water. Put a few tablespoonfuls of milk in a saucepan, add the sugar, and stir till dissolved. Add the remainder of the milk, and heat till blood warm—no more. Take at once from the fire, add the dissolved tablet, and pour quickly over the fruit. Do not disturb till the milk has set, then put in a cool place. Serve with custard and whipped cream heaped on top. Ripe yellow peaches (slipstone) should be used for this dessert.

Peach Blancmange.

Take 3 oz. castor sugar, ½ pint milk, ½ lemon, ½ oz. gelatine, cooked peaches.

Rub sufficient peaches through a sieve to give about half a pint of pulp. Dissolve the gelatine in a saucepan with half a gill of peach syrup and strain it into the peach pulp. Stir in the juice of the lemon, then add the milk very carefully and sugar to taste. Leave until beginning to set, when stir up and pour into a wet border mould to set. Turn out, heap the remainder of the peaches in the centre, and pour the syrup round. A little cochineal may be added to the syrup before being poured round the mould.

Peach Souffle Pudding.

Take 1 tin peaches, 1 pint milk, 1 heaped tablespoonful custard powder, 2 eggs, about 12 almonds, 1½ to 2 tablespoonfuls sugar, flavouring.

Mix the custard powder to a smooth paste with some of the milk. Boil the remainder and stir into it. Return to the pan and boil for two or three minutes, keeping the mixture well stirred, then draw aside and cool slightly. Drain the syrup from the peaches and cut six halves into small pieces, reserving half a peach. Blanch and cut up the almonds, and add them to the custard, with the sugar, peaches, and half a gill of the syrup. Separate the eggs, beat up the yolks, and stir them in. Flavour with a few drops of flavouring, then whisk egg-whites to a stiff froth and fold in lightly. Turn into a piedish, dredge the top of the mixture with castor sugar, and bake slowly for about forty minutes, being careful not to let it boil. Serve cold with cream and place half a peach in the centre.

Peach Gateau.

Take 3 eggs, 1 pint milk, vanilla flavouring, 1 tablespoonful sugar, 2 tablespoonsful desiccated coconut, 4 sponge cakes, peaches.

Beat the eggs, and add the heated milk, sugar, coconut, and crumbled sponge cakes and a few drops of vanilla flavouring. Turn into a buttered mould and cover for about thirty to forty-five minutes, or until set, or else bake gently until set. When cold, turn out, pour peach syrup round, and heap some peaches on top. Serve with cream.

Empress Peaches.

Take 4 oz. rice, 4 fresh peaches, 2 oz. castor sugar, 4 spoonfuls red currant jelly, 1½ pints milk, vanilla flavouring.

Cook the rice in the milk in a double boiler, adding the sugar till the rice is soft and the milk has been absorbed; then add flavouring to taste. Peel and halve the peaches, remove the stones, and place the fruit in a baking tin. Cook for two or three minutes in the oven. Heap the rice in a hot dish and arrange the cooked peaches on top. Put the jelly in the baking tin, and, when it is dissolved, pour it over the peaches. This sweet can be served hot or cold.

THE PICNIC SANDWICH.

The first secret of a good sandwich lies in the bread. Any kind can be used that combines well with the desired filling—white, brown, wholemeal, raisin, or nut—but it should be of close, firm texture, and one day old to give the best results.

The second secret of a good sandwich lies in the treatment of the butter. It should always be creamed before spreading.

When your sandwiches are made, the problem of keeping them moist presents itself. Nothing is more disappointing than a dry sandwich. If for picnic use, each should be wrapped in waxed paper. Moistness is more assured if wet butter muslin is wrapped about the whole pile of paper-wrapped sandwiches, and then a thick wrapping of paper tied in place.

Of all sandwiches, those made with chicken are usually considered the most delectable. Chicken lends itself best to combination wtih other delicately flavoured foods, and to use with white bread.

Creamed Chicken Sandwich.

Chop the chicken (a small amount will go a long way), add a little chopped parsley and celery salt, add chopped olives, and mix with a small amount of white sauce. Cool and spread on buttered wholemeal bread.

Chicken and Almond Sandwich.

Mix one cupful chopped chicken and one cupful blanched almonds (chopped).

Blend them with eight tablespoonfuls cream and season with three-fourths of a teaspoonful salt, one quarter teaspoonful paprika, and a dash of pepper. Use with either white or wholemeal bread.

Chicken and Nut Sandwich.

Take 1 cupful cold chicken, ¼ cupful pecan nut meats, ½ cupful celery mayonnaise.

Chop the chicken and nuts finely and add the celery, cut in thin slices. Mix with the dressing and spread on rounds or fingers of unbuttered bread, laying a lettuce leaf on the mixture. Top with a buttered round or finger.

Egg Yolk Sandwich.

Rub the yolks of hard-boiled eggs to a smooth paste, adding melted butter, salt, and pepper, and spread on wholemeal or white bread. To vary, add a little chopped celery.

Devilled Egg Sandwich.

Boil three eggs hard; cool, peel, and halve. Mash the yolks with two tablespoonfuls soft butter, half a tablespoonful French dressing, half a teaspoonful Worcester sauce, and half a teaspoonful onion juice.

Work in one teaspoonful chopped olives. Spread between lightly-buttered slices of white bread.

Egg White Sandwich.

Chop the whites of the eggs used in devilled egg sandwiches fine, and add pepper, a minced gherkin, and enough mayonnaise to make a spreading paste. Use between wholemeal bread.

Anchovy and Cheese Sandwich.

Mix one tablespoonful anchovy paste and one cream cheese, a teaspoonful of olive oil, and a teaspoonful of horseradish. Spread between slices of brown bread.

Fried Oyster Sandwich.

Place two fried oysters on a leaf of lettuce and lay between slices of thinly buttered bread. These are good cold. Boiled salad dressing may be added if desired. Thick creamed oysters may also be used in a sandwich.

Cheese and Mint Sandwich.

Mash cream cheese to a paste with a little cream, adding a pinch of salt. Put a layer on bottom slice of bread and a layer of mint jelly over it. Bread should be cut thin and buttered. Cover with another slice. Cut in fingers.

Devilled Cheese Sandwich.

Take ¼ cupful grated cheese, 1½ tablespoonfuls devilled ham, 1 tablespoonful cream, 4 slices white bread, Worcester sauce to taste.

Mix all to a smooth paste and spread between thin slices of buttered bread.

Banana and Lettuce Sandwich.

Cut slightly stale white bread thin and spread lightly with butter. Mix shredded lettuce with mayonnaise and spread on one slice of bread, putting thinly-sliced bananas on top of the lettuce. Cover with another slice of bread and cut into triangles.

Banana and Pineapple Sandwich.

Mix equal parts, about half a cupful each, of banana pulp and finely-chopped pineapple with two tablespoonfuls honey, a little grape-juice, and the juice of one lemon. Cut bread thin.

Fig Rolls.

Put 3 figs through a mincer, add 2 tablespoonfuls chopped nuts and enough orange marmalade to spread. Remove crusts from soft fresh bread and cut in thick slices, using a very sharp knife. Spread with creamed butter, then with fig mixture, and roll. Place close together and cover with a damp cloth until rolls stay in shape, or fasten with toothpick.

Nut Bread Sandwich.

Cream orange or lemon juice into butter and spread on nut bread. Sprinkle on a little sugar.

Peach and Cheese Sandwich.

Take 2 cupfuls peaches, ½ cupful sugar, cream cheese, salt, cream.

Cut the peaches very fine and add sugar. Mash a fresh cream cheese, adding salt and enough cream to soften. Mix with peaches and use as sandwich filling. Brush the top of each sandwich with cream and sprinkle with chopped salted almonds.

Open Tomato Sandwich.

Put a thin slice of firm tomato on a slightly larger round of buttered white bread. Sprinkle with salt and place a little mayonnaise in the centre. Put a slice of stuffed olive on the mayonnaise.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1940 AND 1939, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' records.	Sept., 1940.	Sept., 1939.
North Coast.	In.		In.	In.
Atherton	0·73	39	0·34	0·41
Cairns	1·65	58	0·38	0·58
Cardwell	1·50	68	0·49	0·28
Cooktown ..	0·55	64	0·83	0·30
Herberton ..	0·54	54	0·20	..
Ingham	1·55	48	0·15	0·05
Innisfail	3·52	59	1·11	3·69
Mossman Mill ..	1·64	27	0·63	0·91
Townsville ..	0·47	23	0·02	..
Central Coast.				
Ayr	1·26	53	..	..
Bowen	0·78	69	..	..
Charters Towers ..	0·77	58	0·01	..
Mackay P.O. ..	1·63	69	0·04	0·34
Mackay Sugar Experiment Station	1·41	43	0·08	0·07
Proserpine ..	1·99	37	0·32	0·38
St. Lawrence ..	1·22	69	..	..
South Coast.				
Biggenden ..	1·47	41	0·27	..
Bundaberg ..	1·52	57	0·55	0·11
Brisbane	1·97	88	0·75	0·45
Caboolture ..	1·76	53	0·63	..
Childers	1·71	45	0·42	..
Crohamhurst ..	2·61	47	0·42	0·35
Esk	2·03	53	0·40	0·27
South Coast—contd.	In.		In.	In.
Gatton College ..	1·49	41	0·69	0·14
Gayndah	1·52	69	1·11	0·05
Gympie	2·07	70	1·88	0·05
Kilkivan	1·64	61	0·96	..
Maryborough ..	1·88	69	1·39	..
Nambour	2·40	44	0·31	0·50
Nanango	1·77	58	0·91	0·16
Rockhampton ..	1·26	69	0·28	..
Woodford ..	2·09	53	1·29	0·42
Central Highlands.				
Clermont ..	0·97	69	0·86	..
Gindie	1·01	41	..	..
Springsure ..	1·26	71	0·82	..
Darling Downs.				
Dalby	1·64	70	1·53	0·01
Emu Vale ..	1·71	44	0·83	0·54
Hermitage ..	1·54	33	..	..
Jimbour	1·42	52	1·50	..
Miles	1·31	55	0·92	0·07
Stanthorpe ..	2·26	67	1·09	1·17
Toowoomba ..	2·06	68	0·96	0·14
Warwick	1·80	75	1·22	0·48
Maranoa.				
Bungeworgorai ..	0·90	26	0·27	..
Roma	1·38	66	0·35	..

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1940.

COMPILED FROM TELEGRAPHIC REPORTS.

Divisions and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·04	80	69	82	21, 22, 23, 24, 30	60	10	83	3
Herberton	..	72	51	84	29	39	1	20	2
Rockhampton	30·14	81	58	91	28	51	3	28	3
Brisbane	30·17	75	55	82	28	49	6	75	4
Darling Downs.									
Dalby	30·17	78	48	86	27	35	3	153	3
Stanthorpe	..	71	40	81	27	27	3	109	4
Toowoomba	..	71	49	81	27	42	4	96	5
Mid-Interior.									
Georgetown	30·05	89	59	95	27, 28	50	8	..	..
Longreach	30·11	87	54	96	27	42	1	..	..
Mitchell	30·14	79	45	91	27	34	15	31	5
Western.									
Burketown	30·06	87	61	94	17, 23, 28	53	2, 3	..	..
Boulia	30·07	86	55	98	26	46	1, 18, 30	..	..
Thargomindah ..	30·12	80	51	94	26	43	4, 14	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1940.		December, 1940.		MOONRISE. Nov., 1940.	MOONRISE. Dec. 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·0	6·11	4·49	6·34	6·0	6·29
2	..	6·11	4·49	6·35	6·53	7·27
3	..	6·13	4·48	6·35	7·49	8·25
4	4·59	6·14	4·48	6·36	8·46	9·22
5	4·59	6·14	4·48	6 37	9·43	10·17
6	4·58	6·14	4·48	6·38	10·40	11·11
						p.m.
7	4 57	6·15	4·49	6 39	11·34	12·2
					p.m.	
8	4·56	6·15	4·49	6·39	12·27	12.53
9	4·55	6·16	4·49	6 40	1·19	1.44
10	4.55	6·17	4·49	6·41	2·10	2·35
11	4·55	6·18	4·50	6·41	3·0	3·27
12	4 54	6·19	4·50	6·42	3·51	4·18
13	4·53	6·19	4·50	6·43	4·42	5·11
14	4·53	6·20	4·50	6·44	5·33	6·4
15	4·52	6·21	4·51	6·44	6·26	6·56
16	4·52	6·22	4·51	6·44	7·18	7·47
17	4·52	6·23	4·51	6 45	8·10	8·35
18	4·51	6·24	4·52	6·46	9·1	9·21
19	4·51	6·25	4·52	6·46	9·50	10·5
20	4·51	6.25	4·53	6·47	10·37	10·47
21	4·50	6·26	4·53	6·48	11·21	11·28
22	4·50	6·27	4·54	6·48	..	..
					a m.	a.m.
23	4·50	6·28	4·54	6·48	12·4	12·9
24	4·50	6·28	4·55	6·49	12·47	12·52
25	4·49	6·29	4·55	6·50	1.28	1·37
26	4·49	6·29	4·56	6·50	2·11	2·26
27	4·49	6·30	4·56	6·50	2·57	3·17
28	4·49	6·31	4·57	6·51	3.45	4·12
29	4·49	6·32	4·57	6·51	4.36	5·10
30	4·48	6·33	4·58	6·51	5·31	6·8
31			4·59	6·51		7.7

Phases of the Moon, Occultations, &c.

7th Nov. ☽ First Quarter 7 8 a.m.
15th „ ○ Full Moon 12 23 p.m.
23rd „ ☾ Last Quarter 2 36 a.m.
29th „ ● New Moon 6 42 p.m.

Perigee, 27th November, at 10.0 p.m.
Apogee, 12th November, at 2.0 a.m.

Jupiter and Saturn passed from the morning to the evening sky in August. Since then the brilliant planet with the smaller companion has attracted attention. Both planets rise earlier each evening until on 3rd November they rise about 6 p.m., climbing the eastern sky until at midnight they are in the meridian. This opposition to the sun and the triple conjunction of Jupiter and Saturn which keeps them together for eight months (a phenomenon which has not occurred for more than two and a-half centuries) was mentioned on this page in August. On 3rd November the planets will be at their nearest to us, Jupiter being 371 million miles and Saturn being 763 million miles. Jupiter could hold 1,300 earths within its mighty globe, and Saturn 760. About this time they are much photographed by giant telescopes to see what changes have taken place since last opposition, for Jupiter is always enshrouded in turbulent belts of dense cloud. Looking down upon this chaotic scene are four pale-faced moons, which can be seen in small telescopes. There are cloud belts on Saturn also, but, owing to its great distance they are difficult to see. The system of flat rings, stretching like a mighty platform 48,500 miles wide round the planet, makes this world unique in the solar system.

Another distant planet, Uranus, is in opposition on 16th November. In order of distance from the sun Uranus is next to Saturn and at opposition will be 1,725 million miles distant. Uranus is not far from the Pleiades and for a short time when near opposition it comes within naked eyesight as a 6th magnitude star. The trouble is, however, to know which of the myriad tiny stars is Uranus.

Quite a rare event is a transit of Mercury. On the morning of 12th November, about ten minutes to seven, those with small telescopes, properly shaded with very dark glass, may see a tiny black dot on the edge of the sun. During the morning, this spot will appear to travel across the sun's disc, passing off before noon. This tiny spot is Mercury; its size will serve to show the huge proportions of the sun compared with a planet. A transit was last seen here in 1927, and the observer noted how much blacker and distinct was Mercury than sunspots visible at the time.

7th Dec. ☽ First Quarter 2 1 a.m.
15th „ ○ Full Moon 5 38 a.m.
22nd „ ☾ Last Quarter 11 45 a.m.
29th „ ● New Moon 6 56 a.m.

Apogee, 9th December, at 6.0 p.m.
Perigee, 25th December, at 4.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night: when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Fodder Conservation.

FODDER conservation as a solution to a major problem was discussed by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, in the course of a recent Press statement. "There is nothing new about the conservation of fodder. Reference is made to it in the Old Testament, and it has been the subject of exhortation during the lifetime of all of us. In essence, it means the storage of foodstuffs against need—that need invariably being a drought," declared the Minister.

Continuing, Mr. Bulcock said that we stored foodstuffs against human needs; we provided wheat from harvest to harvest; we stored butter and other commodities for ourselves; but we left the source from which much of our needs and wealth comes to take care of itself. This did not suggest that we were a provident people and the absence of a State-wide conservation policy had caused the loss of countless millions of pounds. Proteins were an essential to animals as well as man, and constituted one of the greatest of our needs, yet in bountiful seasons proteins—in this State alone valued at an enormous amount annually—were allowed to go to waste. This waste was principally represented by the non-utilisation of pasturage, for pastures reproduced, under favourable conditions, faster than stock life. Much of this protein was lost beyond recall, and when the day of reckoning came we lamented a drought, utilised public finance for relief purposes, and tied a load round the neck of the producer.

Surely, said the Minister, there was a better way. Surely all our lamentations were based on a desire to ensure greater security for the future, a security which would reflect in a more general prosperity. Every producing cow that died was a loss to the State, more especially during this present period when Britain was asking for more butter, more cheese, and more milk products.

From time to time, generally after each drought, the question of fodder conservation came to the fore, but in the glee with which we greeted good seasons the necessity for fodder conservation was soon lost sight of. It must be conceded that fodder conservation on a national scale presented difficulties, but these were not insuperable, for certain farmers in every area of the State had successfully conserved fodder, either as hay or ensilage. Personally, Mr. Bulcock said he held the opinion that conservation was largely a problem for the individual. There had been a tendency in the past to talk in terms of national service rather than in terms of individual security, and because of this tendency the tasks involved had overwhelmed the designers. Roughly speaking, Queensland farms could be divided into—

(*a*) Those capable of producing hay or silage crops as insurance against drought;

(*b*) Those which, by their situation, must remain dominantly grassland; and

(*c*) The pastoral areas where, at best, only limited forms of conservation were possible.

Silage paid good dividends, added the Minister. In other words, it seemed clear that the agricultural areas must provide much of the fodder needed by the pastoral areas during dry periods, although he knew of certain pastoral holdings in Central Queensland where the making of silage constituted a part of the normal year's routine, and the owners of those properties assured him that the making of silage paid handsomely.

It must not be assumed that fodder conservation was not practised in the agricultural areas, for it was, and last year several hundred silos were laid down in the State; yet only the fringe of the problem had been touched. He believed that it was the duty of the Department of Agriculture to ''sell'' silos to the producer, for his desire was to see a silo on every possible farm.

Why had progress in this direction been so slow? he asked. There was a variety of explanations, principal of which were the cost, the additional routine work, and the fact that capital was lying idle both in respect to silos and the crop. However, those difficulties, real enough, vanished when balanced against the favourable factors of additional security, the more assured income that stored fodder yielded, and the introduction of balanced production.

Fodder conservation, in its narrowest aspect, had a special meaning for the dairy farmer who also was a pig raiser.

It should be remembered that a minor drought occurred in the State every five years and a major drought overtakes us every ten years. We suffered as a State in consequence, but much of it was due to our own fault. The 1936 drought cost the dairying industry alone about £3,000,000, and the drought just broken would probably reveal a similar loss.

The Fodder Position in Queensland.

"QUEENSLAND is happily placed in respect of fodder storage," added Mr. Bulcock. We could, over a restricted but growing area, produce lucerne for hay, but too much importance was frequently attached to lucerne. We had other crops that could be successfully conserved. We were a maize-producing State, and in many of our maize areas legumes other than lucerne could be grown for mixing with the maize silage.

Then again, during the past year there had been a healthy extension of the newer varieties of sorghums, which constituted an excellent fodder crop in areas where maize growing was precarious. Sorghums, although the newest of the alternate grain and fodder crops, would be an important influence in the development of fodder conservation in Queensland. The elimination of the prickly-pear had given access to new areas for cultivation, particularly in the Dalby, Tara, and Chinchilla districts, and it was good to observe that in these districts a vigorous conservation policy was in operation.

There was a time when complete reliance was placed on the concrete silo, which was, with its necessary equipment, the most expensive form of silo, but in recent years the usefulness of the pit silo had been demonstrated. The stack silo, with its attendant waste, could not be recommended, but if the choice lay between a stack of silage and no silage at all, then let us have the stack by all means.

Finance would, of course, continue to constitute the big question in relation to fodder conservation, remarked the Minister. The Commonwealth Bank was a national institution designed to be of service to the people and he had often thought that no better national investment was available for this institution than money for fodder reserves.

It was perhaps not generally known that there was a silo officer attached to the Department of Agriculture, whose duty was to instruct and supervise the building of silos, and that field officers of the Department also were available for this service.

In addition, the Department provided concrete moulds to producers who planned to construct a silo. Last year the Rural Development Bureau had undertaken a silo drive on the Atherton Tableland. There, silos had been put down for a number of producers at an average cost of £1 per ton capacity. The average capacity of these silos was 80 tons, representing 80 tons of worth-while insurance.

Appointment of a Fodder Conservation Committee.

MR. BULCOCK went on to say that a fodder conservation committee had been appointed from among experienced officers of his Department who had special knowledge of the cultural and economical factors involved and special training in all forms of farming practice. This committee was, he stressed, already at work on the examination of proposals for a State-wide fodder conservation drive. "We are to-day paying the penalty of past neglect, but I am of opinion that we have at last learnt our lesson and will soon prepare for the next dry spell," he added. The first factor in the success of the proposals was a "fodder conservation consciousness," and he believed that that consciousness was already passing from the abstract to the concrete and only required guidance to ensure a solution of the major problem confronting the producers of Queensland—the problem of recurring drought.

Brown Paper Bunch Covers for the Control of Banana Rust Thrips.

N. E. H. CALDWELL, M.Sc.Agr., Assistant Research Officer.

BROWN paper for bunch covers continues to find favour with many banana-growers, mainly as a protection for the fruit in the winter, but also in some cases as a substitute for hessian covers in the banana rust thrips control programme. At the present time hessian is expensive, and it is probable that only paper covers will be available to those growers intending to put rust thrips control measures into operation during the 1940-41 summer.

In the past, some paper covers have failed to stand up to wear and tear in the plantations, especially during the coastal wet season. Recently completed tests under plantation conditions of a number of different classes of paper enable the requirements of banana-growers to be defined somewhat more precisely than has hitherto been possible, and they indicate that a satisfactory brown paper cover can be selected for all plantations.

Paper Characteristics.

Generally speaking, the heavier the paper the better its weather-resisting properties, while unglazed papers are superior to glazed in this respect. Thus, an unglazed paper of a D/C rating* of 35 lb. wore very well, and was superior to a lighter unglazed type of D/C rating 26 lb., which, though used extensively by growers, has not been entirely satisfactory. Similarly, a glazed paper of 30 lb. D/C rating was somewhat better than another glazed paper of 28 lb. D/C rating, but the latter was definitely inferior to the lighter unglazed type of a D/C rating of only 26 lb.

It was also found that double tubes (made simply by slipping one tube inside another before placing them on the bunch) withstood adverse weather conditions in the plantation remarkably well. Thus, double tubes of a glazed paper of 30 lb. D/C rating were all absolutely intact after covering bunches for twenty weeks between February and June in a very exposed plantation, and were still intact after a further thirteen weeks' exposure from June to September on a second series of bunches in the same plantation. In contrast to this, a considerable proportion of single tubes of the same paper was fairly badly torn eight weeks after being fitted to bunches in February in the same plantation. Single tubes of this paper were considered suitable only for very sheltered areas.

Brown and other papers treated with various materials such as plastic bitumen, creosote, and linseed oil were tested on a fairly extensive scale, but none proved satisfactory. Most of them showed a decided tendency to cause fruit scalding, particularly in hot weather, while others were discarded on account of poor durability or high cost. The pale colour of the fruit induced by some of these covers does not detract from its market value.

Tubes versus Bags.

Tubes are rather susceptible to tearing by wind. Bags certainly resist tearing somewhat better for the first few weeks, but once a break has been made by the "bell" bursting through the paper they deteriorate rather more rapidly than the tubes. For satisfactory rust control, bunches must be covered as soon as they are "thrown," and as paper covers will not stand the handling necessary to enable the "bell" to be broken off at a later date, paper bags possess no real advantage over paper tubes. Completely closed paper bags also complicate the application of dusts and the determination of fruit maturity. A suggestion for tying the paper tubes loosely at the bottoms of the bunches to minimise movement in the wind has not been fully investigated, but it seems to hold some promise, provided the labour costs entailed in this extra operation are not too great. Satisfactory waterproof glues are now available for joining the edges of the paper. Tubes need not, therefore, be sewn, though there seems no objection to this practice if it is adopted by the manufacturers.

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* The D/C rating is a trade designation based on the weight of a ream of sheets each 20 inches by 30 inches.

Recommendations.

Banana rust thrips control measures involving the use of brown paper bunch covers may therefore be summarised as follows:—

1. In most plantations use single tubes of unglazed brown paper of a D/C rating not less than 30 lb., but preferably of 35 lb.
2. In exposed plantations use double tubes of unglazed brown paper of D/C rating not less than 26 lb., or of glazed paper of D/C rating not less than 30 lb.
3. Cover the bunches as soon as practicable after they are thrown.
4. Apply a 2 per cent. nicotine dust to the bunch at covering, and make three further applications at weekly intervals.
5. Mark the covers so that the age of the bunches, the time to cease dusting, and the time to inspect the bunches for cutting can easily be determined.

The additional cost involved in using double instead of single tubes is largely offset by the fact that at least one layer, and in most cases both layers, of double tubes may be used on a second bunch. Single tubes can seldom be used a second time.

◆

BANANA SUCKERING.

A flush growth of young suckers may appear in most banana areas after heavy summer rains.

Before they form their own root system, these suckers rely solely on the parent plant for their subsistence, and where a number are present they retard the parent plant's growth and the development of its bunch of fruit.

Most growers have a definite time for suckering in their working plan, but others fit in at any time, if at all, with the result that four, six, eight, and up to a dozen suckers, ranging in size from "peepers" to fully-grown plants, are seen, *all* of which have robbed the parent plant of some of its vigour.

Even in the most fertile soils the number of suckers left to bear the grower's next bunch should seldom be more than two, and sometimes three. It is desirable, therefore—particularly if a fertilizing programme is carried out—to destroy all the suckers which are not required as soon as they peep above the ground. At this stage they are easy to disconnect with little damage to the plant, and the fertilizer applied goes *only* to those suckers which will eventually produce the next cutting of bananas.

Seed Inoculation of Legumes.

T. McKNIGHT, B.Sc., Assistant to Research Officer.

PLANTS of the legume family, such as lucerne, clovers, cowpeas, and soybean have the ability to grow in association with certain bacteria, and, as a result, to make use of the gaseous nitrogen of the air. In this way they differ from most other plants which are able to obtain this essential element only from combined nitrogen in the soil, the supply of which is often low. When this association of bacteria and legume exists, characteristic swellings or nodules are formed on the root system of the host plant, and it is inside these nodules that the nitrogen-assimilating bacteria are found. The bacteria absorb nitrogen from the air, and this is passed on to and utilised by the plant for growth.

Two beneficial results are obtained from this association. Firstly, the legume is furnished with an assured nitrogen supply which assists it to make vigorous growth. In the case of lucerne, clovers, and other pasture legumes, efficient inoculation with the appropriate bacteria greatly aids the rapid establishment of a good stand. Secondly, a method is available for building up the nitrogen content of the soil. When legumes of the green manure type are turned in at the appropriate time there is added to the soil the nitrogen which has been gained from the air and stored temporarily in the plant tissues as nitrogenous compounds. If the correct bacteria are absent, neither of these benefits can be expected and, unfortunately, this would appear to be the case in many agricultural soils in Queensland. Under these conditions seed inoculation with a pure culture of the organism is essential.

A selective action is possessed by most if the nodule bacteria which may accordingly be divided into a number of different types or strains. Each strain is capable of inoculating only a certain legume or group of legumes. The more important agricultural legumes may be separated into seven groups, each requiring a distinct strain of bacteria, which will not associate with legumes of the other groups. These groups are:—(1) Lucerne; (2) Clovers; (3) Cowpeas (including peanuts, velvet and lima beans); (4) Vetches (including field and garden peas and broad-beans); (5) Garden bean; (6) Soybean; (7) Lupin.

The bacteria belonging to each of these groups are found to vary amongst themselves in their nitrogen-assimilatory capacity, and while some are very efficient in benefiting the host plant, others may be relatively of little or no value. When providing pure cultures for inoculation purposes an attempt is made to select only those strains which are most efficient.

Three points are therefore evident: Firstly, that it is highly desirable that only inoculated seed be sown on new land. Secondly, that it is incorrect to presuppose the presence of the appropriate strain of bacteria for one legume because another legume well equipped with nodules has been grown before on the same land. Thirdly, that if moderate or even good stands of a particular legume are obtained there is no reason to assume that a further benefit would not accompany inoculation of seed with a selected strain for subsequent sowings.

The Operation of Seed Inoculation.

Appropriate bacteria which have been isolated from nodules by bacteriological methods are supplied to the farmer as a culture growing on jelly in a 2-oz. medicine bottle. With each bottle is supplied 3 grams of a bacterial stimulant, calcium phosphate. The inoculum in one bottle is sufficient to treat up to 60 lb. of the larger seed such as cowpeas, or 30 lb. of the smaller seed such as lucerne or clover.

The inoculation process is simple, and consists in wetting the seeds with a suspension of the bacteria in skim milk. The calcium phosphate is dissolved in half a pint of skim milk, and the whole of the bacterial slime in the bottle is then transferred to this mixture. To do this, pour a little of the milk into the bottle and, putting the thumb over the mouth, shake vigorously, and then pour back into the rest of the milk. Repeat this several times until all of the bacterial slime has been washed off.

The seeds should be piled on a clean surface and then inoculated by pouring on the suspension, a little at a time, meanwhile thoroughly mixing the seeds with the hands until every seed is wetted. The seed should then be spread out in a cool, shady place to dry.

It is important to note that inoculated seed should be sown as soon as possible after inoculation, and should be planted only in moist soil. Seed should be drilled in or, if broadcast, harrowed in immediately, as exposure to sunlight kills the bacteria. Inoculated seed should not be sown at the same time as artificial fertilizer, and if possible the most efficient method is to apply the fertilizer in moist soil a day or two before the inoculated seed is planted.

Store the culture in a cool, dark place, and do not remove the cotton wool plug from the mouth of the bottle until the culture is to be used. The culture should be used as soon as possible after receipt, but it may be held for as long as four or five weeks without marked deterioration. If delays hold up sowing longer than this, it is advisable to obtain a fresh culture.

Farmers requiring inoculum should write, indicating the variety of seed and the quantity to be treated, at least ten days before sowing is anticipated, as this time is necessary for the preparation and despatch of cultures. A charge of one shilling per bottle is made for inoculum.

◆

PASTURE MANAGEMENT.

If seasonal rains occur, many of the pastoral areas in Queensland may soon be well covered with grass and herbage. If widely distributed summer rains do fall, a good autumn crop of long grass should be assured. The effect of autumn long grass is to supplement the organic constituents of the soil. This augmented organic content will tend to maintain the fertility of the pastures. In ordinary circumstances pastures should not be burnt off. This applies especially to sown pastures, such as paspalum and Rhodes grass. The effect of a severe grass fire is to reduce greatly the potential supply of the organic constituents of the soil. If persisted in, the practice of burning-off may result in sterility of the soil. It is possible that bush fires recurring annually form one of the principal factors in the reduction of the fertility of much open forest country to far below that of rain-forest country.

In burnt-over areas, an invasion of non-nutritious grasses may always be looked for. In particular, the farmer with paspalum pastures can watch for the entrance of carpet grasses and rat's-tail grass. The prompt eradication of these almost worthless intruders may mean the saving of many weeks of labour in two or three years' time when, otherwise, these invading grasses may have spread and seeded.

In paspalum pastures, ordinary white clover should be fostered. A good pasture of this kind can often be established by broadcasting a few ounces of white clover seed to the acre in a paspalum paddock. This can be done during autumn. Generally, white clover prefers a sandy soil.

Maori Mite of Citrus.

N. E. H. CALDWELL, M.Sc.Agr., Assistant Research Officer.

THE Maori mite,* so called in Queensland on account of the characteristic dark-brown discolouration caused to the rind of oranges by its feeding, but known in other countries as the citrus rust mite, orange rust mite, fruit mite, and silver mite, is a common citrus pest in most parts of this State. The skin blemishes on the fruit are well known, the injury caused to leaves and bark is less familiar, but the mite itself, on account of its extremely small size, is seldom seen by the grower.

Life History and Habits.

The adult mites, of which only females are known, are very small, being about 1/200 of an inch in length and about three times as long as broad. The body tapers towards the posterior end, and is divided into segments by a series of rings, each of which is further divided into two on the underside. In colour, adult mites vary from pale to almost golden yellow. Larval mites are similar in appearance, though smaller and almost colourless. The eggs are white to pale-yellow spherical bodies which, though minute, are quite large relative to the size of the female.

The eggs are laid singly or in clusters usually on the more sheltered parts of the fruit and foliage. They hatch after a brief incubation period and the larval mites rapidly reach maturity, moulting twice during growth. The white skins shed by the larvæ commonly adhere to the plant and may remain long after all living mites have disappeared, thus providing a characteristic clue to the cause of the injury.

Although the mites in both adult and larval stages move about quite freely, they do not appear to migrate far from the site on which they are hatched. Consequently, they normally occur in colonies containing eggs, larvæ, and adults. On account of the rapidity with which the mites breed, especially during the warmer months of the year when the life cycle may be completed in a little over a week, these colonies may contain enormous numbers which give to the affected fruit or leaf a characteristic ''dusty'' appearance.

Injury.

Injury to the plant is due to the piercing of surface cells by the mites when feeding. On green fruit, the damaged area first appears somewhat darker than the remainder of the rind, and if the infestation is very heavy the surface may be almost black. A silvery grey may at times be observed in the early stages of injury on oranges and mandarins, but this does not persist. The blemish is always brown on these fruits when mature, the depth of colour varying with the intensity of attack from light-brown to almost black. Lemons, on the other hand, acquire a silvery or at times almost white colour, accompanied in severe cases by shallow but extensive cracking of the rind. Fruit outside the leaf canopy typically has the most severe blemishing on the exposed side, but on fruit inside the tree the discolouration is more usually distributed evenly over the whole surface. Severe Maori mite infestation may occasionally cause some fruit drop, while premature ripening, reduction in fruit size, rind thickening, and interference with normal juice production are also possible effects of injury.

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* *Phyllocoptruta oleivorus* Ashm.

Damage to leaves and bark of the younger wood though frequently encountered, particularly on young trees, is seldom serious. Such injury is, however, often apparent before that on the fruit, and this permits the early detection of a severe infestation before the fruit is appreciably damaged. Mites feed on both surfaces of the leaf but prefer the underside. The first symptom of leaf injury is a bronzing of the surface, a condition exhibited more by lemons than the other varieties, but the final result on all kinds of citrus is the appearance of irregular dark brown patches. Injured bark is as a rule brownish-black in colour, and quite considerable areas on young wood may be thus affected.

The chief loss experienced by growers is due to a reduction in the market value of the fruit on account of its blemished appearance, and not because of any serious defect in its quality.

Maori mite blemishes are still frequently confused by the growers with those due to the melanose fungus, but the two conditions may usually be readily distinguished by the fact that the former is typically smooth to the touch and the latter quite rough.

Control Measures.

(1) As a first step towards control growers should procure a good hand lens magnifying about twelve times and become familiar with the appearance of the mite. Thus equipped a grower should, after a little experience, be in a position to know when to apply control measures during summer and autumn.

(2) In Queensland a lime-sulphur spray (1 in 15) should be regularly applied to citrus trees in late winter before the flower buds start to fill. Though not used solely to deal with Maori mite, it is an essential part of the Maori mite control programme.

(3) Further control measures will then be unnecessary until the summer. Insecticidal treatments for the control of other citrus pests must be applied in most districts during this period, particularly in the months November-December and February-April. Although these treatments may retard Maori mite development, they seldom enable a grower to dispense with special measures aimed solely at controlling this pest. Such measures involve the use of a lime-sulphur spray or a sulphur dust. Colloidal and wettable sulphurs may also be effective, but so far they have not been used extensively in Queensland for this purpose.

Where insecticidal treatments are applied first in early summer and again in late summer or autumn, special measures for Maori mite control will usually be required only in January or February. If late summer or autumn applications are omitted, further mite treatment may have to be undertaken even as late as March. If no insecticide is applied for the control of other pests in November or December, summer control of Maori mite should be established during these months, particularly in districts where the pest is of major importance. Further treatment later in the season may still be necessary if weather conditions favour a rapid increase of the mite.

In deciding on the need for Maori mite control measures and the right time to apply them, a grower must be guided by his observations and by his past experience with it, both in the orchard and in the district as a whole.

The strength of lime-sulphur to be used during the summer will depend on the temperature prevailing at the time of application. Generally speaking, strengths of 1 in 20 to 1 in 25 may be used in the early and late summer, though somewhat weaker mixtures are advisable if temperatures at the time of application are abnormally high. Dilutions of 1 in 30 to 1 in 35 are recommended for mid-summer application. Under no circumstances should lime-sulphur spraying be done during excessively hot weather.

Sulphur dust, which may with advantage be mixed with an equal part of hydrated lime, is preferable to a lime-sulphur spray in hot weather. Where other weather conditions, such as heavy rain, may make a repetition of the treatment necessary, the more easily applied dust has much to commend it. Sulphur dust should, therefore, find a wider application than the lime-sulphur spray during the months of January and February.

Dusting may be done at any time of the day, but the best results are obtained by working early in the morning or later in the afternoon when dew is on the trees and wind velocity liable to be at its lowest.

REWORKING DRONE CITRUS TREES.

In orchards where undesirable types of citrus trees have been cut back for reworking, the final thinning of shoots not required for budding into may be done. Where necessary, the trunks and limbs should be re-whitewashed to continue protection from sunburn. In districts where the growth of new shoots is sufficiently advanced (they should have attained a diameter of some ⅜ in. at the base), and providing that the sap is flowing freely, they may be budded.

When the shoots are ready to receive the bud, a perpendicular cut is made in the bark at or near the base. The cut should be from 1 to 1½ in. in length, and in depth through to the cambium layer. Another cut is then made horizontally across the top of the perpendicular one, so that the two together form a T.

Budwood should be taken only from selected trees which are healthy and vigorous and noted for consistent production of heavy crops of quality fruit. Budwood should be well rounded, mature wood about the thickness of an ordinary lead pencil or slightly less and not more than one year old. Before the buds are cut from the budstick, the leaves are trimmed off so that a piece of the leaf stalk or petiole is left in each case. By this means the bud can be more easily handled after cutting.

The bud may be cut off the stick either from above or below, but the general practice is to cut from below the bud upwards, commencing about half an inch below and ending about half an inch above. The cut must be made with a sharp, thin-bladed knife, and be just deep enough to remove a very thin layer of wood. In the absence of thorns, the wood may be carefully removed from behind the bud, care being taken not to damage the bud.

The bud is then inserted down and under the bark of the stock by raising the latter with the budding knife. In order to bring the bud and stock in close contact, they are bound tightly together with a raffia tie. In from two to three weeks the bud, if it remains green, will have taken—that is to say, united with the stock. The tie may then be cut and the head shortened back to force the sap into the bud. The stud may be utilised to support the shoot from the bud during its early growth, but when the shoot has made good growth and is strong enough to support itself the stub should be removed altogether.

Methods of Dehorning Cattle.

C. R. MULHEARN, B.V.Sc., Director, Animal Health Station, Oonoonba.

A CONSIDERATION of the merits or demerits of dehorning beef and dairy cattle and the most suitable methods of performing the operation have been made the subject of an investigation at the Animal Health Station, Oonoonba, in the course of the past two years.

Horns were evolved as an offensive weapon and they are frequently used as such, resulting in injury and bruising whenever cattle are herded together. The seriousness of the injuries caused by horning in store cattle is not fully appreciated, but it becomes very evident in fat cattle which are being transported to works for slaughter. The losses caused by bruising in fat cattle as a result of horning are very considerable and must amount to many thousands of pounds each year. It has frequently been demonstrated that rejections from a mob of polled or dehorned cattle are on the average much less than from horned cattle which have been subjected to the same conditions. Dehorning also makes cattle more docile, and this in turn allows of more rapid fattening or greater production in the case of dairy cows. The value of the polled or dehorned animal is widely recognised in other countries, and it is unusual to see a horned animal of beef breed in the Argentine or the United States of America. Dehorning also is becoming more widely practised in Australia, and on certain properties all the male calves are treated each year.

The obvious and most satisfactory method of getting rid of the horns is to breed them off, but it will take many years to achieve this object and, in the meantime, dehorning should be practised.

DEHORNING OF CALVES.

Caustic Method.

Calves up to one week old can be treated with caustic, such as a stick or solution of caustic soda or potash. The caustic stick is moistened and applied to the horn bud until bleeding commences. Care should be taken to ensure that the entire bud is treated, but, at the same time, the caustic should not be allowed to run down the head or come in contact with the eyes. Caustic has the disadvantage of difficulty in handling, and in wet weather it may be washed from the horn and cause burning on other parts of the head. This method also leaves a large raw wound, which sometimes takes a long while to heal.

The Hot-iron Method.

An alternative method with young calves is the application of a special searing iron to the horn bud. This searing iron should be round, about 1 inch across, and the searing end should be slightly concave so that it will fit over the horn bud. It should be large enough to retain the heat and have a handle of sufficient length to prevent burning the hands of the operator. This iron is heated to a dull red heat and then applied to each horn bud with sufficient pressure to ensure destruction of the bud. With a little practice operators soon become proficient in the use of this iron. One of the most important points to be remembered in respect to this method is to ensure that the calf is thoroughly restrained on the ground in such a way as to permit the head being rapidly turned from one side to the other, without altering the position of the calf's body. This method of dehorning gives very good results in calves up to one month old and may be used to advantage with dairy calves.

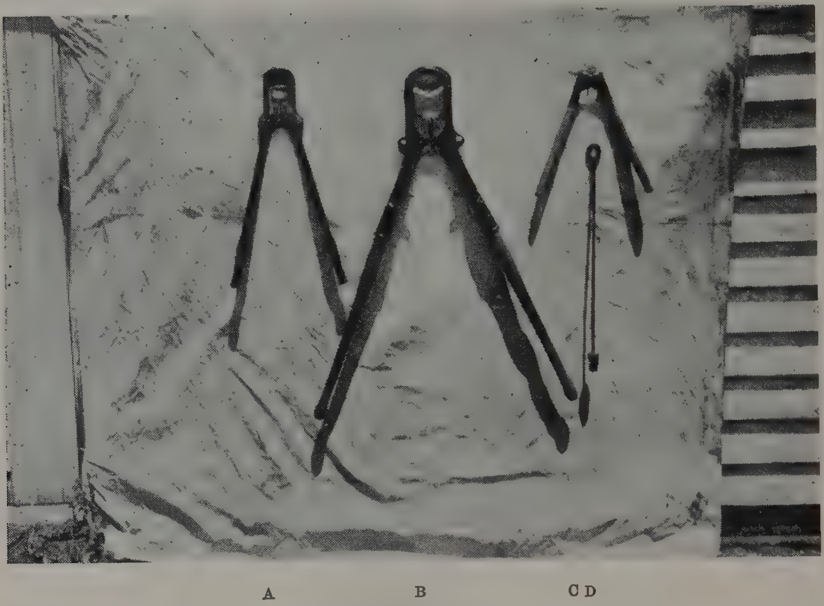

Plate 127.

DEHORNING INSTRUMENTS.—A—Gouge. B—Guillotine Type. C—Scoop. D—Searing Iron.

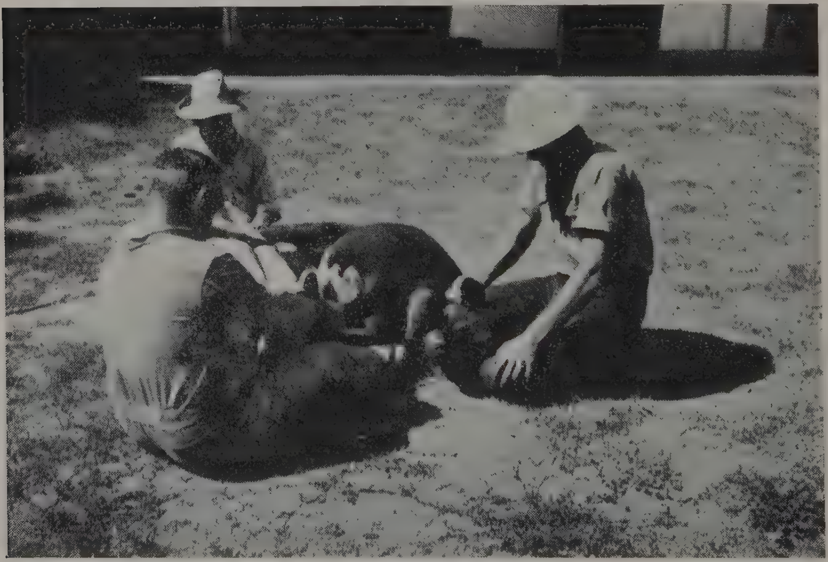

Plate 128.

METHOD OF HOLDING CALF FOR DEHORNING.

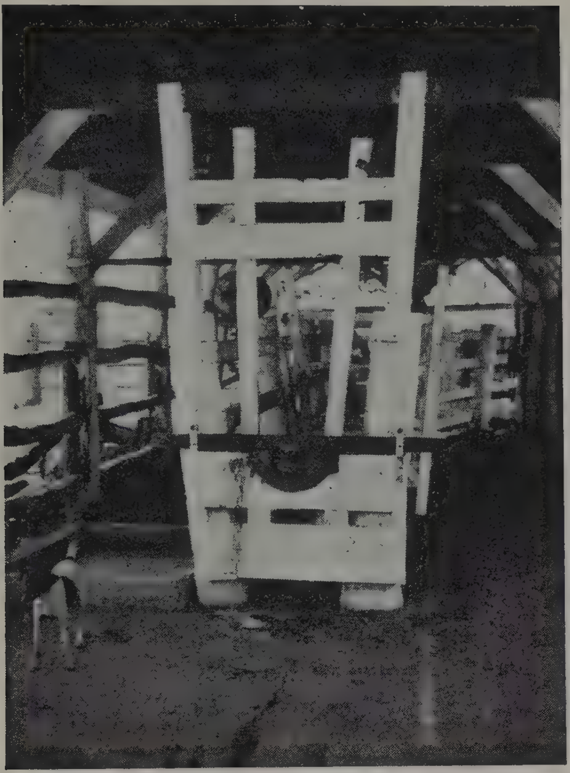

Plate 129.
Dehorning Bail at the Animal Health Station, Oonoonba.

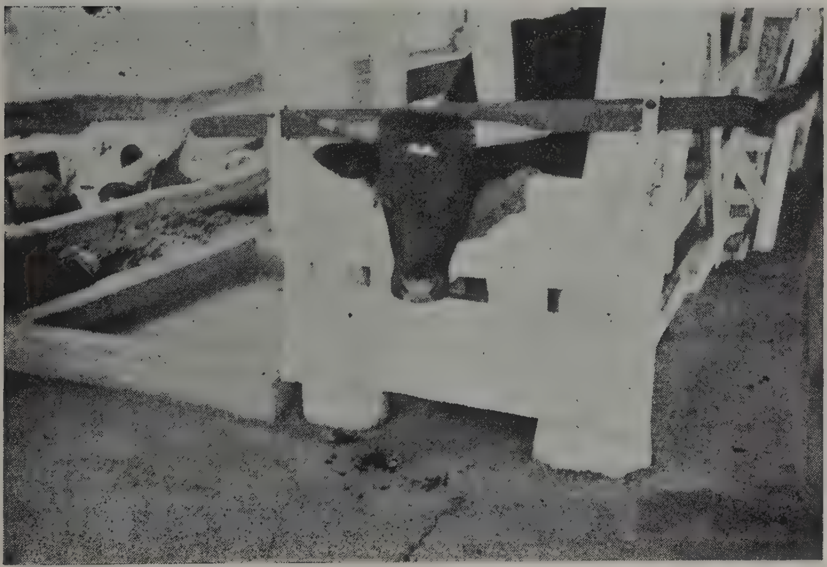

Plate 130.
Steer in Bail Ready for Dehorning.

The Cutting-out Methods.

Calves up to three months old are treated by enucleating the horn buds by means of a special instrument or a sharp knife, followed by the application of a searing iron or a caustic solution. The use of a searing iron has the disadvantage that a fire is necessary for heating the iron. However, as dehorning is usually done at branding time the fire is available, as it is necessary for heating the branding irons. The application of caustic after removal of the bud also is satisfactory, and it has the advantage that no fire is needed and that calves can be treated at any time with a minimum of trouble. A quantity of caustic could be kept at cattle yards and the young calves dehorned any time they are passing through the yards. The disadvantages of the use of caustic are that the small wounds do not heal so readily as when the searing iron is applied and that care must be exercised in its use to avoid burning the fingers or other injury to the user.

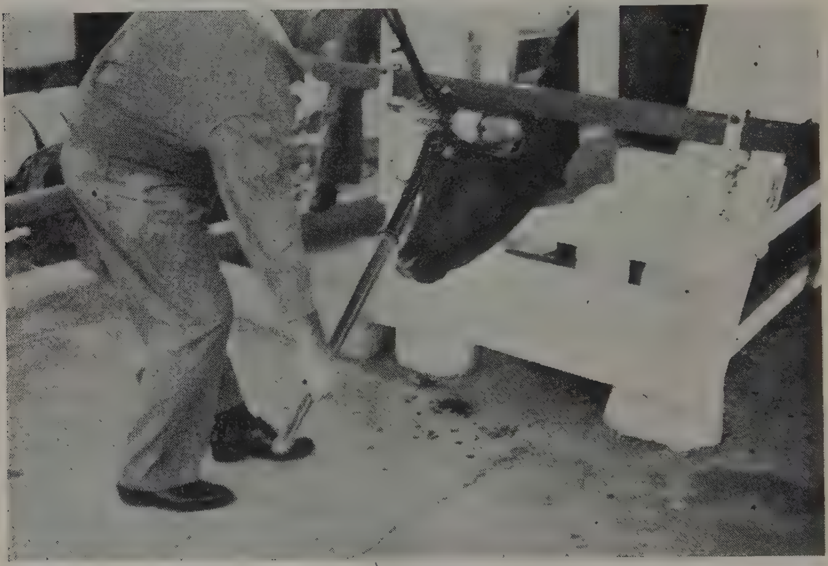

Plate 131.

GUILLOTINE TYPE DEHORNER IN POSITION FOR REMOVING HORN

The setback in calves up to three months old as a result of dehorning is practically nil, the effect being approximately equivalent to that of branding. When the calf is approximately three months old the horn core commences to grow out from the skull and the horny tissues harden, so that it then becomes necessary to employ special instruments for the removal of the horns. Such instruments usually have convex cutters, so that they make a concave wound into the skull. The two types in common use are referred to as the "Scoop" and "Gouge" types of dehorners (Plate 127). The scoop type can be used on animals up to about six months old, whereas the gouge type can be used on animals up to about twelve months old. By means of these instruments it is possible to remove the horns and all horn-forming tissues at the junction of the horn and the skull. When this operation is performed an opening is made into the frontal sinus, which is really an air cavity within the skull. The size of the opening varies with the age of the calf, but it usually closes in from a week to a month, at the end of which time the wound should be completely healed. Bleeding frequently occurs following this method of dehorning, but it can be controlled by the use of a hot searing iron or to a lesser extent by the application of a special dehorning powder. In any case, the loss of blood is never severe in young animals, even if no dressing is applied. Calves from three to twelve months of age are usually treated with this type of dehorner and the setback as a result of the operation is never very severe.

DEHORNING OF MATURE ANIMALS.

With animals over twelve months old, a large dehorner with a straight guillotine type blade is usually employed and a special dehorning bail becomes necessary. Cattle of all ages have been treated with this instrument, and there is usually a slight loss of condition as a result of the operation, although the check in growth of store bullocks is never very great. Bleeding may be severe following dehorning of mature cattle and, although not considered dangerous, it is objectionable and is one of the main causes of loss of condition after dehorning. It can be controlled by the application of a ligature in the form of a cord tied around the base of the horns and across the top of the head, and then twitched tightly by drawing the two pieces of cord together across the top of the poll. This ligature, which has proved very useful for the control of bleeding in dairy cows, should be left in position for from four to twenty-four hours. If the ligature is not applied, the bleeding can be controlled to a certain extent by the searing iron or by the use of a suitable dusting powder. A dressing in the form of a dry dusting powder has been found more satisfactory for use immediately after dehorning than one with an oily or tarry base. Satisfactory application of the latter dressing is difficult. A suitable dusting powder may be prepared by mixing one part of boracic acid, one part zinc oxide, one part powdered alum, and six parts powdered starch.

Although several hundred head of cattle of all ages have been dehorned either at the Animal Health Station or directly under our supervision at other centres, not a single loss due to dehorning has occurred. However, it is not wise to dehorn mature cattle at a time of the year when blowflies are numerous, as the flies may "blow" the wounds in the skull.

TIPPING.

Tipping is often practised as an alternative to dehorning in mature cattle, particularly in bulls, dairy cows, and steers which are beginning to fatten. Tipping consists of the removal of about 2 inches from the tip of the horn, so that the quick or sensitive portion becomes exposed. As a result of this operation, the extremity of the horn becomes tender for a considerable time and the animal will refrain from using it. Even when the tenderness disappears, the animal is less likely to cause ripping or bruising, for the sharp point has been permanently removed.

As dehorning of calves may be carried out at any time of the year without risk of loss, and as the advantages of such an action are outstanding, it is suggested that the question of dehorning all young beef cattle be given serious consideration. The operation could be done

Plate 132.
Yearling and Two-year-old Dehorned Steers at Pasture.

Plate 133.
Yearling and Two-year-old Dehorned Steers at Pasture.

without any great inconvenience to the breeder when the calves are handled for branding or marking. Dehorning is being practised as a routine procedure on several properties in Queensland at the present time, and there is every indication that it will become much more widely practised when it is realised that the operation is very simple and can be performed in conjunction with ordinary station management.

Further information on dehorning may be obtained from the Director of Veterinary Services, Department of Agriculture and Stock, Brisbane, or from the Director, Animal Health Station, Oonoonba, *via* Townsville.

"DON'TS" AND "BUTS" FOR DAIRY FARMERS.

DON'T have the cowshed roof covered with dust and cobwebs;

BUT lime-wash it and brush it down regularly.

DON'T have heaps of manure just outside the cowshed door;

BUT carry it away daily to the paddock.

DON'T wash a whole herd of cows with one bucket of water;

BUT use one bucket of water for every two or three cows.

DON'T use old pieces of bagging for udder cloths;

BUT use clean cloths kept for the purpose.

DON'T leave udder cloths screwed up in damp bundles;

BUT boil them daily and hang them out to dry away from the dust of the yard.

DON'T follow the practice of wet-handed milking;

BUT always milk with clean dry hands.

DON'T milk into kerosene tins or use them for cream, the folds and crevices provide ideal conditions for bacteria;

BUT invest in well-made milk buckets and cream cans.

DON'T commence milking into the bucket immediately;

BUT direct three streams of milk into a separate vessel for rejection. This milk is bacteria-laden and contains little fat.

DON'T allow milk and/or cream to stand in or near the milking bails or dusty yards;

BUT remove it immediately to the dairy or milk stand as the case requires.

DON'T use cloths for straining milk. They are too risky;

BUT use a cotton wad type strainer and strain only once.

DON'T use hot water directly on utensils after milking, as it will bake the milk serums on to the metal;

BUT rinse or soak them first in cold water.

DON'T wipe the utensils with a cloth after washing;

BUT sterilise them by boiling or steaming and allow them to dry without wiping.

DON'T abuse or knock your cows about, for this is one of the chief causes of dirty yards;

BUT treat them kindly—a contented cow will give more and better milk.

DON'T delay the cleansing of any dairy equipment after use;

BUT remember that it is much more difficult once the milk or cream residue has been allowed to harden.

DON'T forget to cool and stir any cream as provided by the Dairy Produce Acts;

BUT persevere and get "Choice" grade every time. It can be done.

An Effective Power Spray for Farm Animals.

L. D. CAREY, Chief Inspector of Stock.

POWER spraying of cattle and horses as a measure of tick control has been proved in practice to be both effective and economical. At the Brisbane Show in August last, a spraying plant designed by the Department of Agriculture and Stock for use on small holdings, and on dairy farms particularly, was set up for demonstrational purposes, and attracted the keen interest of a large number of stockowners. In response to numerous requests for plans and specifications, these notes have been compiled.

Construction.

In the accompanying plan and list of materials required, sawn timber is specified, but if suitable bush timber is available for posts and rails, it may be substituted.

If it is required to spray more than one beast at a time, the crush can be extended to provide for the extra accommodation, and also for an extension of the jetting system.

In preparing the plan, attention has been given to keeping the cost of construction to the minimum requirements. Particular attention should be given to the measurements on the plan, and the inside posts of the spray crush should be spaced so that the piping running horizontally on each side will reach from centre to centre of each post and be clear of the slide gates.

The posts and all woodwork for the crush should be erected first, care being taken to see that there is sufficient space left between the posts to allow the slide gates to pass through. The boarding-in of the sides and slide gates of the spray crush is recommended in order to save waste of fluid from the spray jets during operation.

Sawn timber is recommended for the slide gates, and they can be fitted with either rollers or slide bar at top.

After the construction of the crush, concreting should be the next procedure, the mixture to be as specified. The gravel and sand should be clean and free from dirt or other foreign matter. The concrete floor should have a slight fall towards the centre and side of the crush to the outlet drain into the screening chamber, from which the fluid is run into the holding tank or pit. A concrete sill about 3 inches high should be placed around the floor of the crush to stop the fluid from running outside.

A 200-gallon iron ship's tank or a concrete pit 3 by 3 by 3 feet would be ample capacity, and should be placed or constructed alongside the screening chamber and set in the ground, the top being at ground level.

The piping should be constructed as illustrated (Plate 135). The pipes should be braced to the posts, and the pipes to which the jets are attached placed vertically. The jets should not be exposed inside the crush any more than necessary. The bottom jets should be about 10 inches above the concrete floor.

A centrifugal pump should be erected as near as possible to the fluid tank and bolted to a concrete block.

The engine should be placed in a position suitable for the driving of the pump by a belt. If a small farm engine is available, a concrete foundation block could be erected in a convenient position, and on which

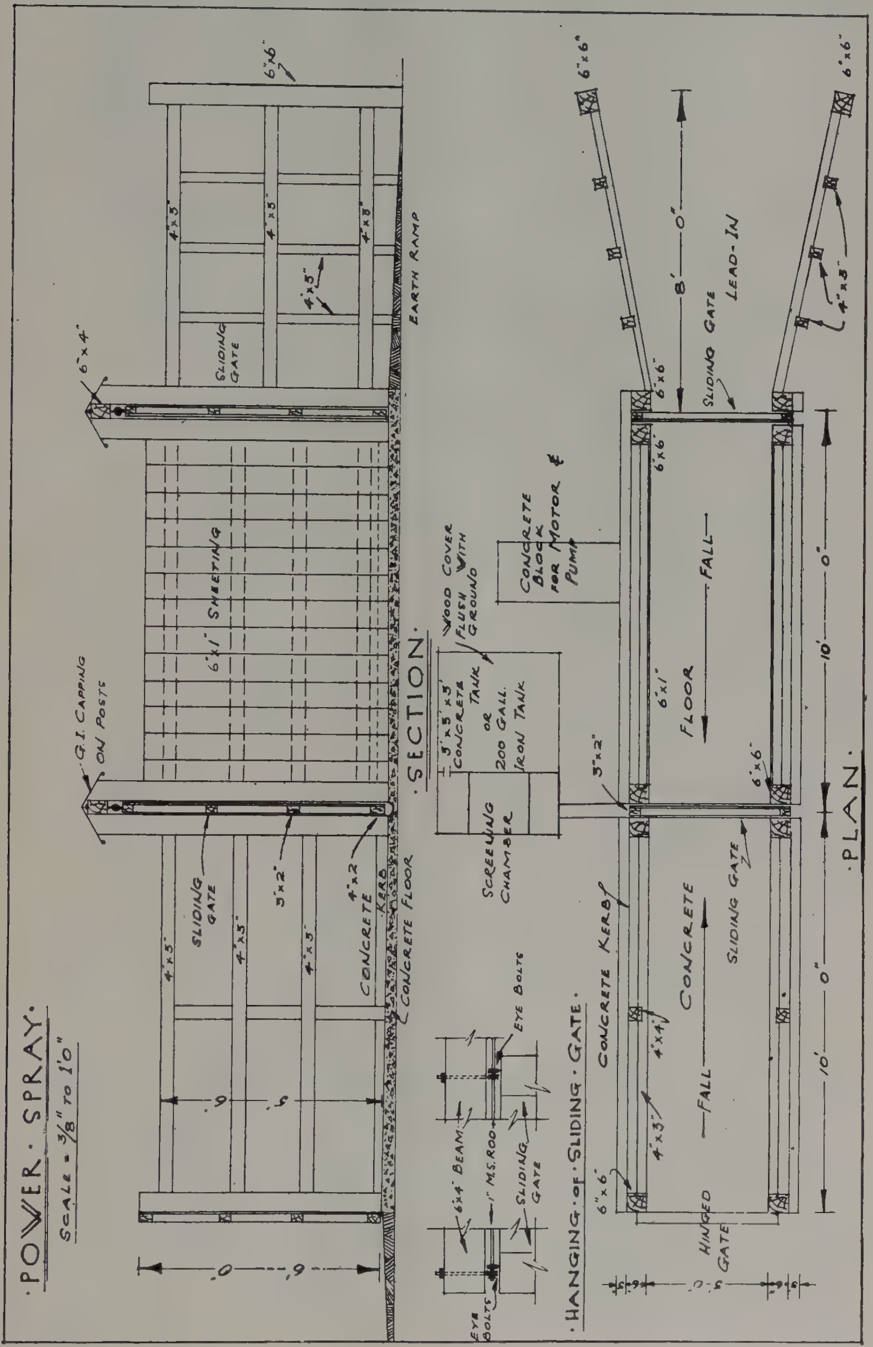
POWER · SPRAY ·
SCALE = 3/8" TO 1'0"
6'-0"
6"x6"
4"x5"
SLIDING GATE
6"x4"
G.I. CAPPING ON POSTS
6"x1" SHEETING
EARTH RAMP
5"x2"
4"x2" CONCRETE KERB
CONCRETE FLOOR
· SECTION ·
WOOD COVER FLUSH WITH GROUND
5'x5'x5' CONCRETE TANK OR 200 GALL. IRON TANK
SCREENING CHAMBER
CONCRETE BLOCK FOR MOTOR & PUMP
EYE BOLTS
6"x4" BEAM
1" M.S. ROD
SLIDING GATE
· HANGING · OF · SLIDING · GATE ·
CONCRETE KERB
4"x4"
4"x3"
HINGED GATE
5'-0"
CONCRETE
FALL
10'-0"
6"x1" FLOOR
3"x2"
8'-0"
LEAD-IN
4"x3"
· PLAN ·

Plate 134.
POWER SPRAY PLAN.

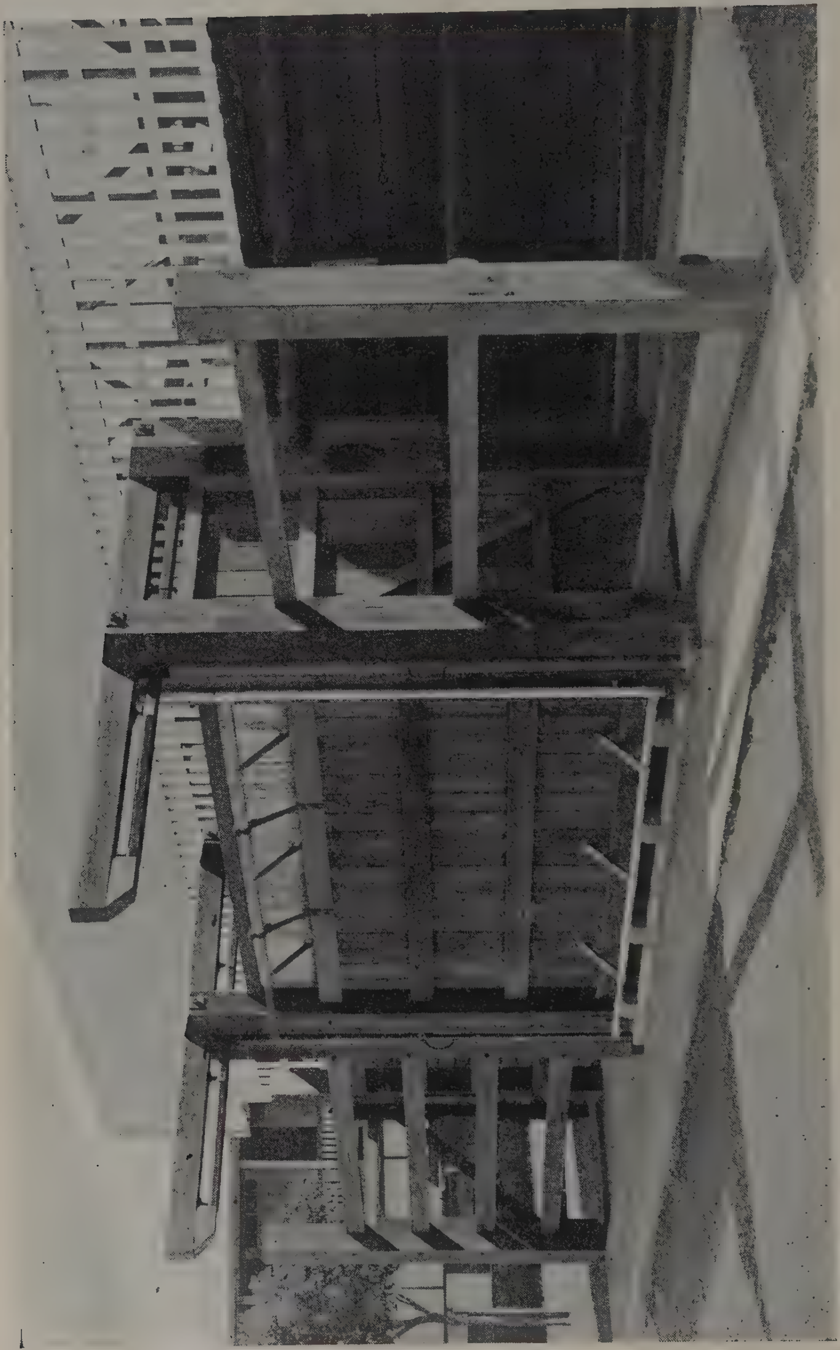

Plate 135.
A SIDE VIEW OF THE SPRAYING CRUSH.

the engine (if of a stationary type) could be placed when required. Where electricity power is available, a power motor could be installed.

The Dip Mixture.

When spraying is to be done, sufficient water according to the number of stock to be sprayed should be placed in the tank. The gallonage should be recorded and the required amount of concentrate added, in accordance with the instructions on the tin or drum. A graduated pint measure is recommended for this purpose. If the concentrate used is of, say, 1 gallon to 160 gallons of water to give the

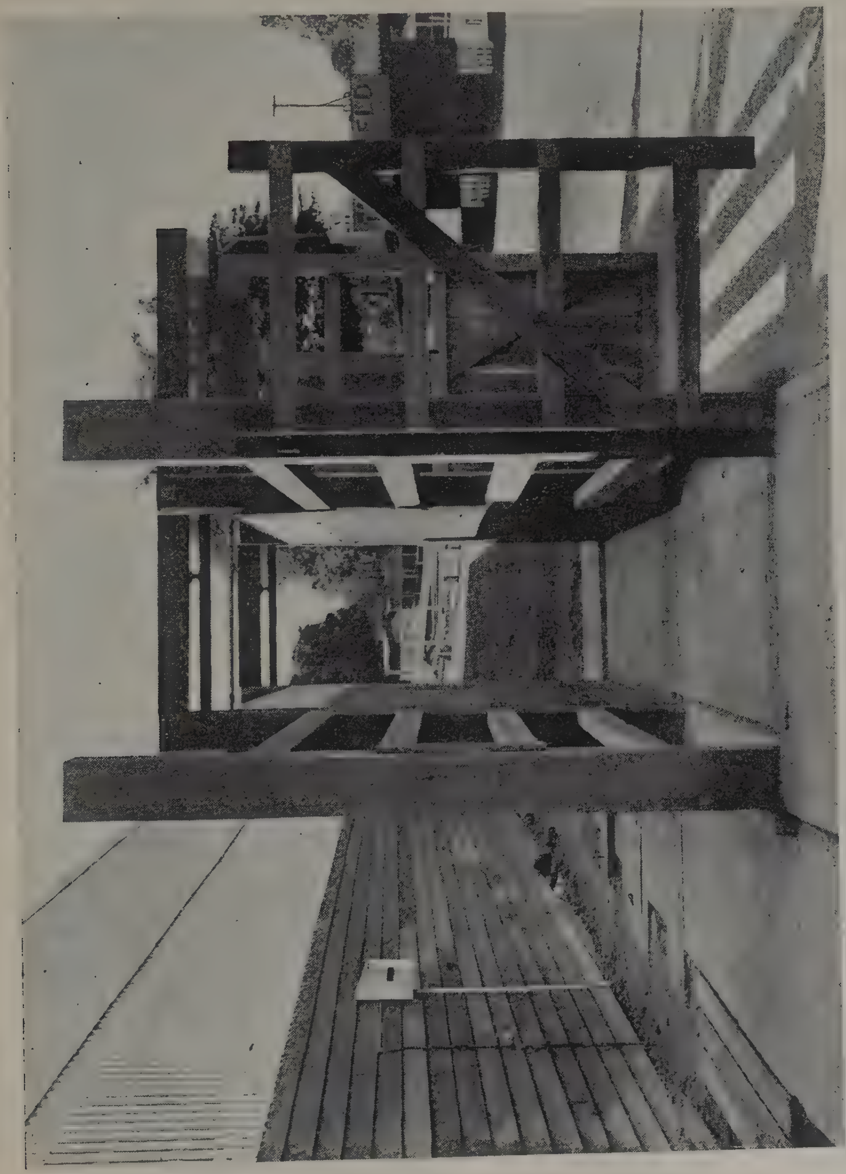

Plate 136.
The Power Spray Crush from Another Viewpoint.

standard strength dipping fluid, it would be necessary to add one pint to each 20 gallons of water placed in the tank.

If there is fluid remaining in the tank after spraying has been completed, the depth of the fluid should be taken, and if required for use some time later the depth should again be checked. If the water is below the previous check mark because of evaporation, water should be added to bring it to the first-mentioned level without adding any concentrate before using. Evaporation obviously increases the strength of the remaining fluid. Water evaporates, but the arsenic does not. Samples of the fluid should be submitted to the Agricultural Chemist, Department of Agriculture and Stock, Brisbane, for analysis before using.

Instructions on the charging of the tank with dipping concentrate is always obtainable from the nearest stock inspector.

A screening bucket for use in the screening chamber is necessary and should be installed.

Operation.

The centrifugal pump may require priming before starting. This is done by pouring water into the priming tap on the pump. The spray is operated from the valve on the pipe line by turning on and off, as required, during the spraying operation.

As each beast is sprayed in the crush, it is passed on to the draining crush, where it drains while another beast is being sprayed, thus saving loss in dipping fluid.

Before treating dairy cows, it is recommended that their teats and udder should be dressed with warm lard or other clean grease to prevent possible scalding of those parts. The teats and udder should be washed before being milked after spraying.

Spraying of all dairy stock on the farm at 18-day intervals will not only assist in the eradication of ticks, but will relieve the stock of tick worry and consequent loss of condition. The minimising of tick worry is naturally conducive to greater milk production, and, if done at the prescribed intervals, spraying will eventually result in the complete eradication of ticks on the holding.

Specifications.

CONCRETE.

	Cub. yd.
Concrete floor, 4-in. thick, 1:2:4 mixture, ¾-in. aggregate ..	1 4/27
Concrete in tanks, walls, and floor, 4-in. thick, 1:2:4 mixture, ¾-in. aggregate ..	17/27
Concrete in screening chamber, walls, and floor, 4-in. thick, 1:2:4 mixture, ¾-in. aggregate	11/27
	2 5/27

ORDER.

Cement, 94-lb. bags	No. 13
Sand	1 cub. yd.
Metal or gravel ..	1¼ cub. yds.
Pudlo or other approved waterproofing compound	6 lb.
610 B.R.C. or other approved fabric for the following areas—22 ft. x 4 ft., 4 ft. x 4 ft.	

CRUSH ROUGH HARDWOOD, SECOND GRADE.

6 in. x 6 in. posts—4/9 ft., 8/10 ft.

4 in. x 4 in. posts—2/8 ft.

4 in. x 3 in. posts—6/8 ft.

4 in. x 3 in. rails—6/10 ft., 6/8 ft., 8/9 ft. 6 in.

6 in. x 4 in. beams—2/9 ft.

6 in. x 4 in. posts to support beam, 2/9 ft. 6 in.

6 in. x 1 in. sheeting—34/6 ft.

Gates—

- 3 in. x 2 in. framing—4/6 ft. 6 in., 2/6 ft., 9/4 ft.
- 4 in. x 2 in. framing—3/4 ft.
- 4 in. x 1 in. braces to gates—2/8 ft., 1/7 ft. 6 in.

HARDWARE.

1-in. diameter W.I. rod for sliding doors threaded at both ends and with nuts and washers, approximately 8 ft. long	No. 2
¾-in. diameter W.I. eyebolts with nut and washer, bolt end 7-in. long, eye to be full 1-in. diameter	No. 6
¾-in. diameter W.I. eyebolts with nut and washer, bolt end 5-in. long, eye to be full 1-in. diameter	No. 4
⅝-in. diameter W.I. bolt with nut and washer to 6 in. x 6 in. posts and 6 in. x 4 in. beam, 16½-in. long	No. 8
½-in. diameter W.I. bolts with nut and washer securing rails to posts, 6½-in. long	No. 12
⅜-in. diameter W.I. bolts with nut and washer securing framing of gates, 2½-in. long	No. 24
⅜-in. diameter W.I. bolts with nut and washer securing framing of gates, 3½-in. long	No. 12
Hinges to swing gate, 12-in. crook and band (pair)	No. 1
Gate fastening, approved	No. 1
Door pulls, 10-in. stamped steel or other approved pull or handle	No. 2
Nails—	
2¼-in x 10 gauge	7 lb.
3 x 8 gauge	2 lb.
4 x 7 gauge	2 lb.
G.W.I. piping and fittings, spray jets, pumphose, &c., also motor and pump as directed and approved.	

CLEANLINESS IN THE MILKING SHED.

Observations at milking time on some dairy farms reveal carelessness which is dangerous from a viewpoint of infection from bacteria. Bacteria in milk and cream are well-known causes of low-grade, inferior products, and safeguards against their introduction are essential.

The milking bucket should on no account be used as a washing utensil, either for the udder and teats of the cow or the milker's hands. The act of washing the udder transfers innumerable bacteria with the dirt and loose hair to the bucket, and a simple rinsing in cold water is not sufficient to remove them all. The need for separate milking buckets and washing buckets is therefore very obvious.

A bucket and cloth for washing the udder and a wash basin for washing the hands before milking each cow are hygienic necessities in the bails. The dairyman may well ask himself the question: "Would I take my meals with hands unwashed after completing milking operations?" The answer would be an emphatic "No!" Yet the cleanliness of his hands during milking is at least as important, for milk and cream are foods which may be easily contaminated.

Clean hands are just as essential during milking as at the dining table. It is therefore remarkable that many people who are scrupulously clean in the home are lamentably careless in the cowyard and dairy.

Another very common practice is the wiping of soiled, milky hands on the clothing. These same clothes, if worn throughout the day, soon acquire a most objectionable smell and attract flies. Sugar-bag aprons—which are easily made, inexpensive and long-wearing—are suggested for use by all milkers. The aprons should, of course, be washed frequently.

The protection of milk against flies is also a matter of consideration. Most dairymen have in use a large, shallow milk vat, and this should be provided with a lid on which an opening has been left for the milk strainer, or, if milking machines are in use, for the releaser. This lid keeps out dust and vermin, and also is a help in maintaining the temperature of the milk before separating.

Hand milkers frequently moisten the cow's teats during milking from the milk in the bucket. This practice cannot be condemned too strongly, as the hands are usually soiled, and bacteria from the udder of the cow are transferred to the bucket.

The following points are all practised by the most successful dairymen:—

Wash the udders in buckets used only for that purpose.

Wash the hands after milking each cow.

Wipe the hands on a clean cloth, not on the clothes, and wear either an apron or overalls.

Aprons and overalls are easily boiled; so keep them clean.

Don't use an uncovered vat. Under the Dairy Regulations a cover for the vat *must* be provided.

The Management of Dairy Farms in relation to increased Milk Production.

J. SHILKIN, H.D.A., B.V.Sc., Veterinary Officer, Brisbane Milk Board.

THE management of dairy farms supplying milk to the Brisbane market is, in some cases, not all that could be desired. The average production is very low, and the methods employed are not always such as to produce the maximum amount of milk at the lowest possible cost. The highest efficiency possible in the different circumstances of locality, area, and other factors should be the aim, and it is considered, therefore, that the following summary of methods would, if carried out, help to attain this efficiency.

Suggested measures may be divided into two main groups, both of equal importance—

A. Management of Farms.

B. Management of Cattle.

A.—Management of Farms.

I. Subdivision of Paddocks.

There should be as many paddocks as practicable to provide for rotational grazing, so that small paddocks may be grazed off quickly by stocking heavily and then spelled. Grass about 5 to 6 inches high is much more nutritious and has a higher feeding value than grass which is at a later stage of growth. Consequently, better results in milk production and a much higher carrying capacity of the same area should be obtained.

There also is the possibility of controlling parasitic infestation. The larval stages of many parasites exist on the pastures for varying periods, and spelling of these pastures by rotational grazing will result in the destruction of a large proportion of the larvæ, with a consequent decrease in the incidence of infestation.

Where creeks make subdivision difficult, the use of specialised agricultural engineering methods would no doubt solve many problems.

II. Establishment of Suitable Pastures.

By collaboration with officers of the Department of Agriculture and Stock, it is possible to ascertain which grasses are the best under certain conditions of soil and climate and the methods of establishing such pastures. There is no doubt whatever that by laying down the most suitable grasses and proper management subsequently, the carrying capacity of any area can be increased immensely.

Large variations in feeding value occur even in good grasses, and a grass which is properly managed may possess as much as twice the feeding value as the same grass under bad management.

III. Fertilization of Pastures.

A large amount of material is returned to the soil in the form of manure, but, generally, too little use is made of it. Occasional spreading of the manure with harrows would be an advantage and, at the same time, provide a light scarification of the soil. The subdivision of paddocks enables the effect of this to be increased.

In districts suitable for the growth of clover, a top-dressing with superphosphate has the effect usually of stimulating growth of clovers. Small scale trials, however, are recommended first to demonstrate the value or otherwise of applying super. in each particular area.

IV. Growing of Crops.

The largest workable area should be placed under crop, both for feeding purposes and for conservation as ensilage or hay.

Of the non-leguminous summer crops, sorghum and maize stand out for silage purposes and also for feeding in a green state, while for grazing purposes white panicum, Japanese millet, and Sudan grass have proved their worth. The lastmentioned is more suitable for inland districts, particularly the Darling Downs and Maranoa.

All members of the sorghum family—and this includes Sudan grass—are likely to cause losses from poisoning if fed when in a fresh green condition before the flowering stage, and it is therefore advisable to allow the crop to flower before grazing, particularly if the crop has received a check from dry weather during growth.

For winter feeding, oats, wheat, and barley, sown either alone or as a mixture with field peas or vetches, are the most widely used.

Of the leguminous crops, lucerne is particularly valuable where it can be grown and maintained efficiently, while cow pea as a summer leguminous crop and field pea for a winter crop are both very valuable for supplementary feeding. Naturally, for all these crops it is advisable to plant good seed of the best varieties consistent with their adaptability to local conditions, and this information may be obtained from the Department of Agriculture and Stock.

V. Conservation of Fodder.

Many farms are sadly lacking in means for conserving fodder. On some, conserved fodder is conspicuous by its absence, and on others too little provision is made for it.

Consequently, dry periods result in the inability to maintain animals in a reasonable condition; and once cattle lose condition it is usually difficult and uneconomical to bring them back to normal milking during that particular lactation period, whereas cattle maintained in good condition milk well during a time when market supplies would normally be low.

Silage is particularly good for dairy cows, as it is palatable and nutritious, and if well made should be almost equal in feeding value to the green crops. Certain types of silos are relatively inexpensive, but even the more expensive ones would amply repay the outlay in a short period.

B.—Management of Cows.

I. Breed.

The breed chosen is a matter for the individual, but to a certain extent will depend on the conditions of the locality or the particular farm concerned. Generally, pure-bred cattle are larger and more economical producers, if properly cared for. than crossbreds and consequently more profitable. However, if crossbreds are used—and this is the rule rather than the exception—it is advisable by using good pure-bred bulls combined with careful culling, to grade up the herd. It is possible in this way to develop a herd which can hardly be distinguished in appearance or production from pure-bred animals.

II. Selection and Segregation of Bull.

From the foregoing it is obvious that the bull must be a high-class animal for the obtaining of the best results. It should be selected, not only on appearance and pedigree, but (and this is most important) it should be the progeny of known high-producing stock.

The bull should not be allowed to run with the herd, despite the fact that this is the prevailing practice. By keeping the bull segregated in this way, it is possible to control matings more satisfactorily and so regulate lactation periods, which is an important factor when supplying milk. It also is very important from the standpoint of disease control. For instance, the presence of vaginitis in the herd can be determined much more readily than when the bull is running with the herd, and so enables treatment to be carried out sooner.

III. Control of Diseases.

Disease is the cause of very heavy economic loss to the dairying industry, and the diseases most frequently encountered are T.B., contagious abortion, mastitis, and vaginitis. These diseases, in the main, are somewhat insidious and do not give rise to spectacular losses. Consequently, they may appear to the farmer much less important than they really are and he may thus tend to disregard them. However, most of these diseases can be eradicated, and farmers should avail themselves of the facilities at their disposal for this purpose.

IV. Culling.

Culling should be heavy, and sentimental considerations should not be allowed to outweigh economic factors. A definite standard should be set for milk production, and if any cow does not measure up to this standard there should not be any hesitation in passing her out. High producers are definitely economical producers, while low producers, despite the fact that they may require less feed, are decidedly uneconomical.

Other reasons for culling are, of course, age and disease.

V. Milk Recording.

The keeping of records of milk production is advisable and will be very useful as a guide to culling. It should not be difficult to weigh the day's milk from each cow, and if this is done at weekly intervals, or even monthly intervals, a fairly accurate record of the profitability or otherwise of each cow will be obtained. Many cows milk well during the early stages of the lactation period, but do not maintain their production for very long, and the average production of such cows will be very low. The keeping of production records, therefore, will indicate these cows much more accurately than mere guesswork.

VI. Rugging.

Rugging is a very useful practice in the winter months. Cows will naturally be more contented, and by helping to maintain the usual body temperature of the animals, rugging will obviate a certain proportion of the feed being utilized as fuel.

VII. Dehorning.

The practice of dehorning makes cows more docile and less liable to fight each other. Any factor which keeps cows quiet and contented will have a tendency to improve production.

VIII. Feeding.

Feeding is naturally one of the most important factors associated with milk production, as correct feeding may mean the difference between profit and loss to the farmer. The main points to consider are the maximum utilization of pastures and crops and, where necessary, the addition of concentrates to the ration. For the most efficient production, the condition of the cows must be kept at a high level. Once they lose condition for any reason—dry conditions, disease, or any other cause—it is generally a most difficult and costly process to bring them back to normal condition and production. Generally, to maintain production in the Brisbane milk-producing districts during the winter months, it is advisable to feed concentrates. This also applies, under certain conditions, to some farms during the summer months, particularly those where only a small amount of cropping is carried out.

It has been shown that a cow of average weight requires about 50 lb. of roughage (grass, green feed, &c.) for maintenance—that is, for all normal bodily functions. Consequently, if little feed is available over and above that figure, it stands to reason that only limited amounts of milk can be produced. Therefore, it is necessary to add concentrates to the feed—larger quantities when the feed is scarce or poor in quality, and smaller quanties when the feed is plentiful and nutritious.

Where concentrates have not previously been fed it is not, as a rule, economical to commence on animals whose lactation period has extended beyond five months, except in the case of animals that have been in between five and seven months, when concentrate feeding may be adopted in preparation for the following lactation.

Milk is a substance rich in protein and minerals, particularly lime and phosphorus. Consequently, it is necessary to provide feeding stuffs which are rich in these materials. Obviously, cows cannot for long secrete more of these substances in the milk than they obtain from their feed. As milk is rich in protein, it is necessary to take into consideration both the analyses and the prevailing prices. The costlier concentrates are not necessarily the best, but, on the other hand, the cheaper ones are not necessarily the most economical, while a concentrate which is economical to feed in one State may not be economical to feed in another State.

In Queensland, excellent results have been obtained with a mixture of a concentrate high in protein and one high in carbohydrates. The best of the former are protein meal (meat meal) and blood meal, and, of the latter, maize meal, wheat meal, and sorghum meal have given the best results. Which combination of these should be used will depend on the prevailing prices which may vary from time to time.

It has been found that with cows on poor feed producing, for example, 1 gallon per day (4 per cent. butterfat), the addition of 1 lb. protein meal (or blood meal), 3 lb. cereal meal (maize, wheat, or sorghum meal) will increase production to 2 gallons daily. Increase or decrease of these quantities will increase or decrease production proportionately, after allowing for the time lag. It must be remembered, however, that these results will only be obtained in cattle which have the potential capacity to produce these larger quantities of milk, hence the necessity for proper breeding and culling.

By feeding concentrates, admittedly the feeding costs will be increased, but the net returns should greatly offset the increased cost, always providing the right concentrates are used. For instance, the cost of feeding 1 lb. protein meal and 3 lb. of sorghum meal is, on present prices, about 3½d. per day. An increase of 1 gallon per day will, therefore, show a handsome profit.

With regard to feeding protein meal and blood meal, it is pointed out that care is frequently necessary in persuading cows to take them. Animals which are underfed and in poor condition, or animals that have been accustomed to small quantities from birth will usually present little difficulty, but others should only be fed small quantities (even as low as a teaspoonful) at first and, if possible, in combination with attractive feeds, such as linseed or cottonseed meals. Even then it may still be difficult, and it may be necessary to let animals go hungry for a day or two. Admittedly, milk producers would not be particularly keen on carrying out the latter process because of the temporary drop in milk production, but once animals take the concentrate the returns will justify the trouble involved.

Protein meal or blood meal should not be allowed to become damp or to remain in feed boxes, as they putrefy rapidly.

Cottonseed meal may be quite useful as a concentrate but, generally, is more costly than the protein or blood meals. Actually 3 lb. of protein meal is practically equivalent to 5 lb. of cottonseed meal; so that, to make the latter as economical a feed as the protein meal, it would require to be nearly half the cost, and that is not the case.

Other concentrates may be useful and economical, but this will also depend on the analyses and prices. The actual value of these materials can be worked out, and this should always be determined by application to the Department of Agriculture and Stock.

IX. Provision of Mineral Supplements.

As mentioned previously, milk is extremely rich in minerals, particularly lime and phosphorus, and unless cows are on particularly rich feed it is very doubtful if the supply of these minerals will be adequate. Therefore, it is highly desirable that provision be made for their supply, and for this purpose the best and most economical source is sterilized bone meal. This should be combined with salt, which also is essential, as follows:—

Sterilized bone meal	2 parts
Salt	1 part

and fed at the rate of 2 oz. per day, mixed in the feed.

Where cattle are on good feed and on protein meal (which actually contains a certain amount of bone meal), it may only be necessary to add two tablespoonsful of salt to the ration, particularly when there is an adequate water supply.

It is advisable to allow dry cattle access to a mineral supplement in the paddock, and this can be put in boxes under cover. One of the best of these mixtures is:—

Sterilized bone meal	2 parts
Powdered limestone	2 parts
Salt	1 part

The proper application—including, of course, the modification where conditions necessitate it—of all the above factors is essential if the farmer is to produce milk along the most efficient and economical lines. Haphazardness in any direction may well lead to uneconomic production.

CARE OF CREAM IN THE SUMMER.

In summer time dairy farmers should, it is suggested, exercise more than ordinary care in ensuring cleanliness in every detail of dairy practice, otherwise it will be difficult to avoid rapid deterioration in the quality of milk and cream. A little extra care will ensure the maintenance of quality and, in consequence, a top-grade test.

Premium for Quality.—To exemplify the financial advantage of supplying choice cream, assume that the daily production on a farm is 60 gallons of milk having 3.8 per cent. butter-fat test. If the separator screw is set to deliver one part of cream to 9 parts of skim milk, then 6 gallons of cream of 38 per cent. fat test will be obtained from the milk. This is equivalent to 28 lb. of commercial butter. Calculated on the basis of 1s. 2d. per lb. for commercial butter, and in accordance with the statutory difference in payment for the respective grades, the price payable by a butter factory for such a quantity of cream would be—

Grade.	Daily Return.			Monthly Return. (30 days.)		
	£	*s.*	*d.*	£	*s.*	*d.*
Choice at 1s. 2d. per lb.	1	12	8	50	0	0
First grade at 1s. 1½d. per lb.	1	11	6	47	5	0
Second grade at 1s. 0½d. per lb.	1	9	2	43	15	0

Importance of Sterilized Utensils.—The chief factor in milk and cream production is the sterility of the utensils, over 80 per cent. of the original bacterial contamination of milk being due to this source. Scrupulous care of the utensils alone (provided there is no carelessness otherwise) is the best safeguard of cream quality. Rules to observe in the cleansing of dairy utensils are—

1. The rinsing out of residual milk with cold or lukewarm water.
2. The removal of fat and grease by washing in warm water in which a fat solvent, such as washing soda, is dissolved. Use a scrubbing brush and not pieces of rag for this purpose. This makes a utensil "physically clean."
3. The near-sterilization by the use of sufficient quantity of boiling water or steam. This makes a utensil "bacteriologically clean."

Other Rules.—Other rules requiring careful observance are—

1. Washing of the udder with a moistened cloth. A weak solution of permanganate of potash (Condy's fluid) is useful for this purpose. The udder cloths should be boiled and hung to dry after each milking.
2. Milking with clean hands. A washbowl, towel, and soap should be provided.
3. Storage of utensils and cream away from the possibility of dust contamination.
4. Cooling the cream and maintaining it at as low a temperature as practicable.
5. Stirring the cream frequently.
6. Maintaining a cream test of between 38 to 42 per cent. butter-fat.
7. Not mixing warm cream with cold cream until the animal heat has been reduced.
8. Frequent delivery of cream to the factory.

Systematic and strict observance of these rules is an assurance of satisfactory cream returns.

Hay Bale Battens.

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UNDER the provisions of "*The Stock Foods Acts*, 1919 *to* 1935," it is prescribed that the total weight of battens used on bales of hay shall not exceed 10 per cent. of the gross weight of the bale. A recent inspection of the hay being offered for sale revealed that, in the main, the battens used are well below this very liberal allowance. This applies particularly to hay received from other States of the Commonwealth, which is packed with battens which weigh considerably less than those generally used in Queensland. However, cases do occur in which legal requirements are not observed. Bales are sometimes "loaded" with one or more battens of excessive weight, some weighing as much as 11 lb. each.

The accompanying photograph of battens selected from hay offered for sale tells its own story.

The concern with which a purchaser of hay would view his delivery when battened with heavy timber of the sizes illustrated (battens D to G) may well be imagined. This concern is obviously detrimental to the selling value of a consignment, even if the total weight of the battens is within the limit imposed. The weight of wood actually used on a bale should be the absolute minimum necessary to stand the strain imposed.

Overweight battens is a serious matter for the purchaser, especially of a large consignment. Hay so unduly "loaded" is a distinct breach of sound marketing principles, the effect of which recoils justly on the head of any producer or consignor who so offends, whether through carelessness or otherwise. In preparing any commodity for market, a little extra care and attention to its "get up" invariably pays. A good reputation among purchasers is obviously an asset to any seller.

In order not to exceed the maximum allowed, and to provide for a uniform pack, the total number of battens per bale should not exceed eight. No batten should be longer than the bale, and should be not more than 3 inches wide by not more than half an inch thick.

When the battens on any bale of hay are suspected of being in excess of the prescribed maximum dimensions, the hay is liable to seizure, in which case a period of thirty days is allowed for the overweight battens to be replaced. In the event of seizure the seller would be called on to bear the expense incurred, including any storage charges that may be involved. In the event of non-compliance with the Act within the thirty days, the hay would be subject to forfeiture.

The provisions of *The Stock Food Acts* provide a penalty of £20 for the first offence, £50 for the second offence, and £100 for subsequent offences.

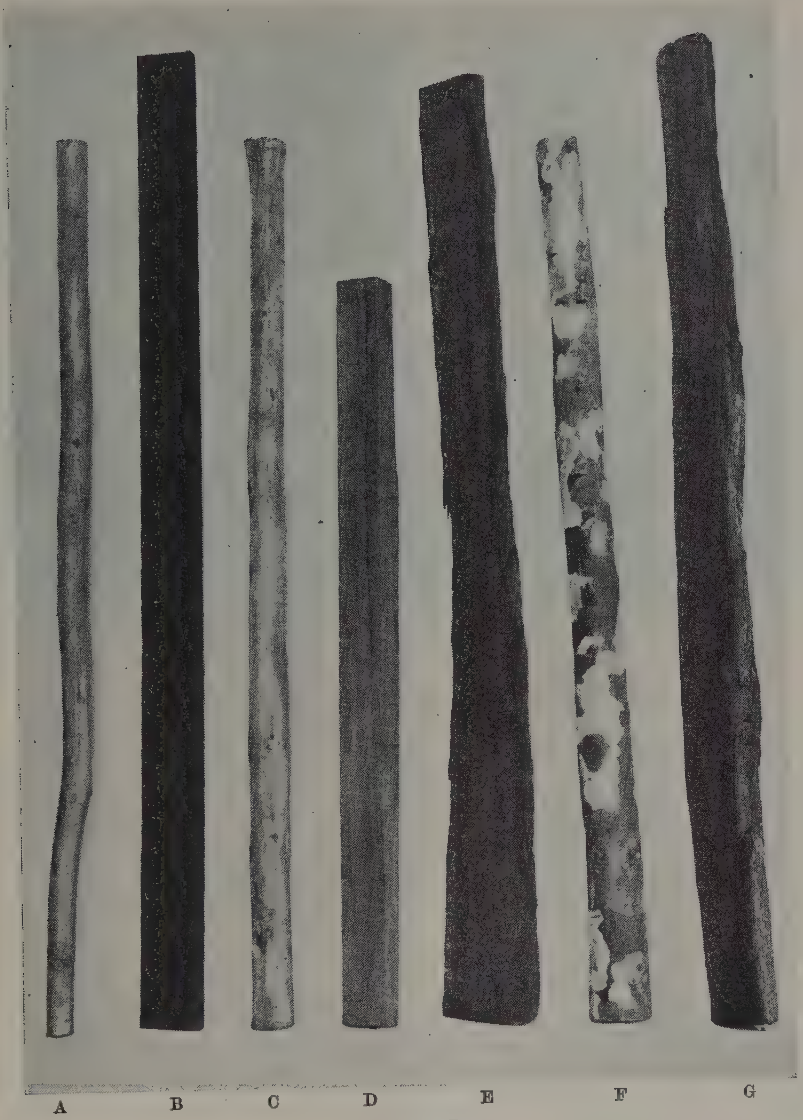
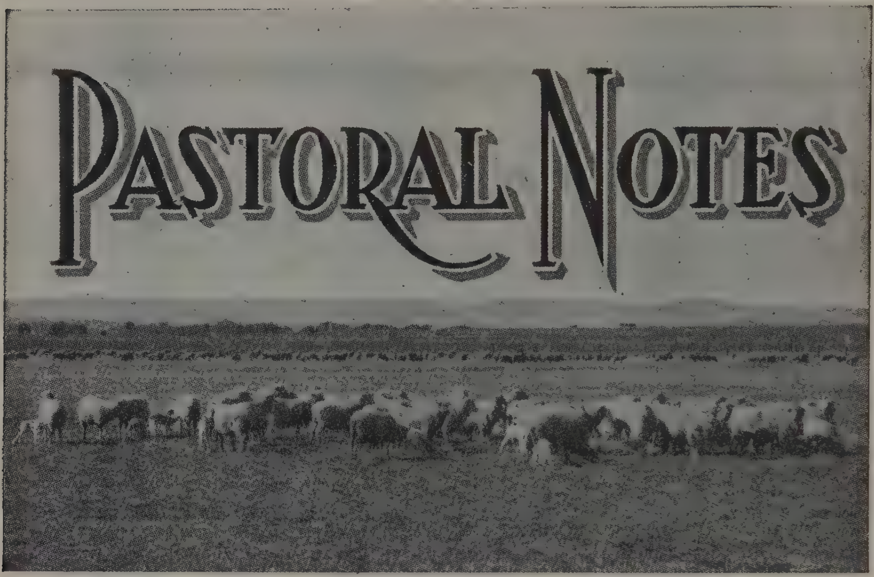


Plate 137.

Hay Bale Batten Specimens, Selected from a Market Consignment.

—	Weight.	Size.	Length.	Remarks.
	Lb. Oz.	Inches.	Ft. In.	
Batten A	1 15¾	1½ (diameter)	3 7¾	Round green sapling
B	2 14	3 x ½	4 0	Sawn hardwood batten
C	3 4	1⅞	3 7¾	Round green sapling
D	5 9	2⅞ x 1½	3 0	Sawn hardwood
E	6 8½	5¼ x 1¾	3 10¼	Split hardwood post
F	7 4¾	2¾ (diameter)	3 7½	Round green tree
G	11 1¼	3½ x 2¾	4 0	Split hardwood post



Drenching Sheep.

BEFORE drenching, an effort should always be made to ascertain which species of worm is the cause of the trouble, and this can readily be done by a post-mortem examination of a badly infested animal. The fourth stomach, small and large intestines, should be cut open and examined carefully, and if the animals are coughing, attention also should be given to the lungs.

For the worm that occurs in the fourth stomach—the barber's pole worm—bluestone is recommended. Carbon tetrachloride is also very effective against this worm, but there is some risk attached to its use, and it is therefore no longer recommended by the Department of Agriculture and Stock.

Bluestone and nicotine sulphate are used for the removal of the small hair worms which inhabit the small intestine. Hair worms are the cause of a disease known as ''black scours.'' Infestation is most severe among young sheep, in which the losses may be very heavy. Bluestone and nicotine sulphate is the only drench which is of any value against these small worms.

Where a mixed infestation of stomach worms and hair worms occurs—a frequent experience, especially in young sheep—the bluestone-nicotine sulphate drench should be given, as this drench is effective against the stomach worm also. Moreover, it may be used for the removal of tapeworms from lambs, although these worms may also be removed by arsenic and epsom salts.

For the nodule worms in the large intestine, there is as yet no efficient method of removing them by means of drenches which are given through the mouth. They may, however, be combated by the use of an enema containing sodium arsenite, which, if administered carefully, has a very high degree of efficiency.

Lung worms are treated with certain drugs which are injected into the wind-pipe, the formula being—

Oil of turpentine—1 cubic centimetre.
Creosote—0·5 cubic centimetre.
Olive oil—2 cubic centimetres.
Chloroform—0·5 cubic centimetre.

This formula represents a dose for one adult sheep. For lambs, the dose is reduced by one-half.

In country subject to worms, the sheep should be given treatment at regular three to four-weekly intervals during the summer months, for otherwise little or no benefit from the treatment may be evident. Treatment is to be regarded only as a temporary measure in the fight against worms, for it must be realised that when paddocks are heavily infested with worm larvæ the animal is no sooner freed of worms by treatment than it is attacked again by larvæ which are picked up by the animal when grazing. In about three to four weeks' time the larvæ have grown and have reached such a size and attained such numbers that the health of the animal is again affected.

Further information on mixing and administering of these drenches may be obtained from the Animal Health Station, Yeerongpilly.

DISINFECTION.

The object of disinfection is to destroy organisms and ultra-visible viruses which cause disease. It is a job which should certainly be done after the occurrence of one or more cases of contagious disease, such as tuberculosis, contagious abortion, swine fever, and influenza.

Periodical disinfection of stables, milking sheds, piggeries, and poultry runs is highly commendable as a measure of disease prevention.

The extent and thoroughness of the work would depend on the nature of the disease which had occurred, and would not need to be so extensive or intensive when merely carried out as a routine measure.

A common error in disinfecting premises is to first remove accumulations of excreta, discharges, dirt, and dust; otherwise, the casual organisms and viruses contained in the accumulations are disseminated throughout the building, and may lodge in places which cannot be easily covered by the disinfecting solution afterwards.

The proper way is first to apply liberally to all parts of the premises a suitable disinfectant in solution, and to leave it in contact for twenty-four hours.

After the disinfectant has been allowed to act for that period, the walls and floor should be scraped (or scrubbed), and the scrapings soaked with kerosene and burnt.

Suitable solutions are phenol or other coal tar preparation (1 pint to 4 gallons water), chloride of lime (1 lb. to each gallon of water), or crude carbolic acid (1½ pints to 4 gallons water), to be sprayed on all surfaces.

If shearing sheds and yards are disinfected before shearing commences, losses of stock through infection of wounds may be avoided.

LAMB-MARKING.

Lamb-marking should be done under the most hygienic conditions possible. The work consists of castration and the insertion of the registered earmark on the off ear of ram lambs, and of marking similarly the near ear of ewe lambs. In addition, an age mark is frequently placed on the ear opposite the registered mark. Tails are removed from all lambs.

The ewes and lambs should be mustered and yarded the night before marking, thus avoiding operating when the lambs are in a heated condition, which leads to excessive bleeding.

All instruments should be cleaned and disinfected thoroughly. Ear-marking pliers should be frequently dipped in a prepared disinfectant in the course of operations.

There are two recognised methods of castration—viz., slitting and tipping.

Slitting has its advantages in that it leaves the wether with a more pronounced cod. However, when flies are bad there is a greater tendency for the lamb to become flyblown. In tipping, the tip of the purse is entirely removed. Tipping is the better method of the two in the opinion of many sheepmen, as it leaves a cleaner wound with better drainage. The wound so made also heals more satisfactorily. Moreover, tipping is faster—a fact which counts when thousands of lambs have to be marked.

The best age at which to mark is from a fortnight to three weeks. A proved fly remedy, both curative and antiseptic, should be applied to all wounds. The use of old yards should be avoided if practicable.

YELLOWWOOD.

A NATIVE PLANT POISONOUS TO STOCK.

Yellowwood (*Terminalia oblongata*) is a small tree common in the Central districts of Queensland, particularly about Emerald, the leaves of which have been proved to be poisonous to sheep. The tree should not be confused with the large timber tree found in South-Eastern Queensland and known by the same name.

The leaves are mostly an inch to one and a-half inches long, and the flowers small and insignificant. The fruit is about an inch long.

Sheep are prone to eat the leaves when these are shed by the tree, as happens in dry weather and, therefore, at a time when other feed is likely to be scarce.

Symptoms Produced.—The leaves are not unpalatable to sheep. Symptoms consist of nervous disorders manifested by ''fits.'' These, however, do not appear until after the sheep have been eating the leaves over a period of several days or even weeks. If the sheep are disturbed, these ''fits'' may be aggravated. The animal is seen to drop down in its tracks as though stunned, and lies trembling and rigid, or the head may be raised and swayed from side to side. The attack may last from a few seconds up to nearly a minute. When on its feet again it sways unsteadily for a few moments, then moves off to join the flock.

The presence of strangers, or loud noises near the animals, seems to induce the ''fits.''

So far as is known, cattle are not affected, although a peculiar wasting disease of animals in the yellowwood areas is possibly associated with the eating of the leaves. This is a subject for further investigation.

Post-mortem.—On post-mortem, the plant is found to have been rolled into hard masses or lumps which tend to block the intestine and set up digestive disturbances, such as impaction. These results have been confirmed in experimental tests. Sheep are usually found dead on the edges of water-holes or where they have fallen over the branches of fallen trees, and where they have found difficulty in again rising to their feet.

General.—As with many other poisonous plants, the chemical nature of the poison present in the leaves and responsible for the ''fits'' is not known. Nothing can, therefore, be recommended for administration to the animal to combat the effects of the poisonous agent. Sheep which have been on the plant for some time suffer a considerable loss of condition and there is also a corresponding loss in wool production.

THE EWE FLOCK.

No operation on the property, as a part of general management, is of more importance than the systematic culling of the ewe flock.

All work on a grazing place has for its object, as a matter of course, the making of money. Judged from this point alone, culling definitely pays. It costs no more to feed a profitable sheep than a waster.

From another point of view, the opinion is ventured that 2,000 well-bred and well-fed sheep give a greater return than 3,000 indifferently-bred and half-fed animals. Then, again, the additional space one is able to give the smaller number must come into consideration.

Culling should be done when the fleece has about twelve months' growth, and should apply not only to the ewe flock, but also to the young sheep, especially those which it is intended to keep as future breeders. It is necessary to have fixed a definite type in the mind, and consideration should be given to a type suitable to the particular district in which the property is situated, and stick closely to that type.

Any sheep not measuring up to the standard should be rigorously rejected, and this does not apply only to the covering of the animal. Apart from the fleece, some of the common deficiencies which should be taken into account are: Want of size and conformation, body wrinkles denoting the ''fly trap'' sort of sheep, a leaning towards delicacy of constitution, bad feet and heads, besides many other deficiencies recognised readily by a good classer during the practical operation.

Regular culling leads to the establishment of a good flock, but the full benefit of the practice is not achieved unless better rams are provided for in the policy adopted.

CARE OF SICK ANIMALS.

Stockowners are frequently required to diagnose and treat sick animals and, from their constant observation of stock in good health, are quick to notice any abnormal behaviour due to sickness. A knowledge of the normal temperatures, pulse, and respiration rates of various animals is most valuable in arriving at a correct diagnosis of the trouble. The temperature of all young animals is somewhat higher than that of older animals, and various influences—such as periods of oestrum (heat), time of day, external temperature, and so on—may alter the temperature of the mature animal. The temperatures of healthy farm animals are—horse, 99·5-101 degrees; cow, 100-101 degrees; sheep, 103 degrees; pig, 102·5 degrees.

The temperature of an animal is usually measured in the rectum, and a self-registering thermometer such as is commonly used in ordinary medical or nursing practice may be used. Care should be taken to see that the column of mercury is shaken down. A small quantity of vaseline smeared on the bulb as a lubricant to assist the passage of the instrument is desirable, and it is inserted with a circular motion between the fingers, forward in a line with the backbone, and allowed to remain for a few minutes before it is withdrawn carefully and the reading taken. If the temperature of an animal is found to be about 2·5 degrees above normal it is said to have a low fever; if it reaches the vicinity of 4 degrees above normal a moderate fever is indicated; and if in the neighbourhood of 6 degrees above normal it has a high fever.

In some diseases, such as tetanus and sunstroke, the temperature may be as much as 10 degrees above normal. Having decided by use of the thermometer whether the sickness is of a febrile (pertaining to fever) or non-febrile nature, treatment and nursing must be considered.

Good nursing is of the utmost importance. The patient should be provided with a soft bed, shade from sun, wind, or rain, and a rug in cold weather. A supply of water and green feed also should be provided if possible.

Medicines are usually administered by the mouth in the form of a drench, and it is necessary to use care and patience when using this method. The head of the animal should not be raised above a horizontal position, and only small quantities of the drench poured into the mouth at a time, allowing time for swallowing. Pinching the throat to induce swallowing should not be practised, and the head should be lowered if the patient commences to cough.

BRUISING OF CATTLE.

The meat export industry is seriously prejudiced by the bruising of cattle when travelling to the meatworks, and the annual loss to both the owner and the State is considerable. Bruising is caused by many factors, particularly so when journeys are long, but the two chief causes are ill-treatment and horning, because of faulty supervision during trucking and in transit.

Cattle travelled to market on the hoof always give a higher percentage of first-class beef than railed stock, provided, of course, they have the condition and weights essential for export. Much of the bruising attributed to train travelling is caused in the trucking yards. In many instances, every endeavour is made to load the trains in a minimum of time. This is a mistake. Care should be taken to avoid crowding in gateways, because, where jamming occurs, the outer beasts are bruised on ribs and hips. Precautions are necessary both at the crush entrance and in the crush. If cattle are trucked in ''single file,'' their sides do not come in contact with the rails. Drovers in charge should insist that no unnecessary force is used to drive the cattle, for every injury affects the quality of the carcase.

Competition in the chilled and frozen meat trade to-day is keen, each competing country endeavouring to produce a better carcase; therefore, if Australia is to retain or increase her output of first-grade beef, the cattle received at the meatworks must be of prime quality and free from injuries of any kind. Growers and dealers may assist the trade by judicious handling of stock. Dehorning is essential. This is a simple operation and should be done when branding. Records proved conclusively that polled cattle give a much higher percentage of first-quality beef than horned cattle.

Dehorned cattle are also much more docile in the paddocks, cover less country when feeding, and retain condition longer.

The Dairy Farm

Keeping Cheese Milk Cool.

THE problem of holding milk overnight during the warmer weather without an appreciable rise in acidity and multiplication of bacteria is a difficult one. Most cheese factories are, fortunately, situated on the Darling Downs, which, because of altitude, enjoy cooler nights than some other parts of the State.

Mechanical cooling is not always practicable, so the fullest use should be made of other means available for keeping the milk as cool as possible. Milk freshly drawn from the udder is at a temperature of 102 deg. Fahr., the normal body temperature of the cow. Unless the animal heat is reduced as soon as possible, the milk will only slowly adjust itself to atmospheric temperature, and bacterial multiplication will be rapid. Another reason why it is sound practice to reduce the temperature is that freshly drawn milk possesses what is called a germicidal power—the ability to restrain bacterial growth—for some hours. The actual period in which this property is active depends on the temperature of the milk. At 90 deg. Fahr., it is only about three hours; at 70 deg. Fahr., about ten hours, and still longer with lower temperatures.

Where water is plentiful on the farm, and assuming it is laid on to the dairy, the most suitable method of cooling milk under the prevailing conditions, is by passing it over a tubular metal surface-type cooler, through which water is circulating, preferably water direct from a bore. If water is unavailable in sufficient quantity, aeration of the milk over a plate-type aerator will bring the temperature down to that of the atmosphere. The beneficial effects of cooling and aeration are beyond dispute, but they may be completely nullified if the cooler or aerator itself is not kept scrupulously clean and well scalded or sterilised, for the original bacterial contamination of milk may be greatly augmented if either is neglected.

Aeration or cooling of the milk is also necessary if cottonwood filter discs are used for straining.

After the milk has been cooled, it is necessary to hold it under the best conditions practicable to prevent any rise in temperature. Milk kept in a closed dairy retains its heat, or even tends to become warmer, in a close atmosphere, with a consequent increase in bacterial activity. Milk kept overnight in a moving current of air has the heat withdrawn from it more rapidly, but suitable protection against marauding animals and the early morning sun should be provided. The milk stand now required by the Dairy Regulations in which to hold the night's milk is very suitable for the purpose, for the cool air fanning the cans overnight keeps the milk much cooler than in an enclosed room. Distributing the milk in as many cans as practicable, say, half filling each can, assists still further in achieving the desired end, while some farmers even place wet bags around the cans on very hot nights to ensure more effective cooling. Finally, the milk cans should always be covered in transit to the factory as a protection from the sun.

CREAM BLENDING.

An examination of cream on the receiving platform of almost any factory will indicate the necessity for careful treatment and storage on the farm. Proper blending of the cream after separation is essential.

The process of cream ripening assists the production of delicate butter flavours.

The development of lactic acid in the cream is desirable, because the lactic acid bacteria if present in large numbers prevent the undesirable off flavours and taints from developing.

Small quantities of cream are more difficult to hold in a satisfactory condition than larger quantities, and consequently, the dairy farmer should keep his supply in as large a bulk as possible.

Objections to blending have been raised by some dairy farmers, who claim that if the cream from each milking is kept separate, only portion of the supply will be graded second-grade when sent to the factory. To this objection, however, it might be stated that the aim of dairy farmers to-day is, or should be, to have all and not merely part of their cream of the highest ''choice'' quality.

To blend correctly, the cream from each separation is first cooled for about an hour before adding to the bulk supply, which should always be kept as cool as possible.

If the use of the cooler and aerator has been effective, the cream should then be ready for blending. The farmer must satisfy himself, however, in all cases that the cream is sufficiently cooled before attempting to add it to the bulk.

Thorough and frequent stirring with a metal stirrer is necessary for correct blending.

If two or more cans are to be sent to the factory, approximately equal portions of the cool cream from each separation should be placed in each can. This will ensure that a standard cream is supplied.

CREAM STIRRING.

Some dairy farmers show by the cream which they send to a factory that they lack knowledge in regard to the care of cream on the farm. Clean methods in production may be nullified by the spoiling of good cream in the dairy.

As butterfat is the lightest constituent of cream, it rises gradually to the top as soon as the cream enters the can. Therefore, in unstirred cream the lower layers, rich in separated milk—which contains a high proportion of casein, and consequently a low proportion of butterfat—are at the bottom. Changes in the separated milk due to bacteria are often such that when the cream reaches the factory it is graded down as sour and curdy.

A dry film on the top of the cream or layers of different colours and texture through the can tells the grader at once that the cream has not been stirred, and he is immediately impressed by the defects in it.

To keep a uniform consistency of cream and to ensure the best possible ripening conditions, the cream should be cool before it is added to any existing supply. Regular stirring is then necessary to liberate accumulated gases and aerate the mass, which ensure uniform consistency. Aeration not only reduces the temperature of the cream, but also retards the growth of undesirable bacteria.

Stirring pays because no dairy farmer can afford to lose the difference in price between choice and lower-grade creams on each consignment that he sends to the factory.

TO CHECK A BAD HABIT IN CALVES.

Skim milk-fed calves are often seen sucking each other after the buckets have been emptied. This bad habit should be stopped. Septic conditions, malformed teats, distorted udders, and early lactation in heifers may be traced to the habit of calf sucking calf. Either keep the calves away from one another by leg-roping until the taste of milk has dissipated, or feed them with meal—e.g., crushed or ground grain, pollard, bran, &c.—immediately after they have finished the milk.

INFERIOR CREAM.

One of the most common sources of the contamination of cream, and one that is often overlooked, is the badly washed cream can.

More cream is spoilt by being stored or carried in a badly washed can than by most other ways. This applies to cans in good order as well as those that are dinted and rusty.

The reason is not far to seek. Hundreds of cans pass through the same rinsing water of the mechanical can-washer at the butter factory daily, and although a final steaming is carried out in the last stage of the washing process, it is not of sufficient duration (nor is it practicable) to sterilise thoroughly all of the cans thus treated.

It should be obvious that cans which have contained second-grade cream will require extra attention, in order to prevent the transmission of taints due to bacterial activity—such as cheesiness and rancidity—to the fresh supplies of cream.

A tallowy smell which is often found in returned cans may be due to inefficient washing, followed by exposure to the heat of the sun, causing deterioration of the fat.

Is is, therefore, advisable, in order to safeguard the quality of cream, to rinse all cans on their return from the butter factory with boiling hot water to which a little washing soda has been added. The cans should then be rinsed with clean boiling water to remove all traces of the soda.

The storage of the cleansed cans is important. They should be placed upside down on a suitable rack to allow for cooling and drying. On on account should anything but boiling water be used for the final rinsing, nor should any attempt be made to dry the cans with a cloth. The storage rack should be placed in such a position as to be well removed from any possibility of contamination from the stockyard.

DRY MILKING IS CLEAN MILKING.

Milking with hands which are moistened with milk at the beginning of and during milking is known as wet milking. Dry milking—which is used always by the cleanest and most efficient milkers—means commencing with clean dry hands, which are kept as dry as possible during milking.

The method of milking with unwashed udder and teats and moistening the unwashed hands with milk is an objectionable and dirty habit and seriously contaminates the milk, as well as chapping the teats. To anyone who doubts this no further evidence is necessary than a glance at the accumulation between the fingers of the person who practices wet milking. In some countries where milkers' competitions are held at agricultural shows and elsewhere, deliberate wet milking disqualifies a competitor.

It should be remembered by the dairy farmer producing milk for city or town requirements that wet milking causes loss of keeping quality, a serious disadvantage in a warm climate.

It is often claimed that dry milking is difficult for anyone unaccustomed to it and, in attempting a more hygienic method, vaseline is used as a lubricant to make stripping easier and to help keep the teats soft and flexible. This is certainly to be preferred to careless wet milking, but if the teats are washed before starting to milk and the milker also washes and dries his hands frequently during milking—as required by the Dairy Regulations—both are generally sufficiently pliable and the use of vaseline should be unnecessary.

Injured or chapped teats should be protected during milking by placing round them a piece of cotton wool and afterwards applying a suitable ointment. The ointment hastens healing and softens the teats for the succeeding milking.

TREATMENT OF CREAM.

Dairy farmers are again advised to give close attention to the cooling, aerating, and stirring of cream. The flush growth of grass in the wet season often causes a grassiness in cream, as well as a "feedy" flavour. Aeration and cooling will do much to offset the development of these defects.

MILK CONTAMINATION.

Numerous researches have established that the two chief sources of bacterial contamination during milk production are the degree of sterility of the utensils used and the personal influence of the milker, but significant contamination occurs from several other sources and may even, on occasion, outweigh that due to the first-mentioned factors. It has to be remembered, too, that the effect of the various factors is cumulative; so it is essential to exercise the utmost care in all operations if the contamination is to be kept down to a minimum.

Two objects, the contaminatory influence of which may appear to be of only minor importance, but which cause infection and which are often overlooked on many farms, are milkers' stools and leg ropes. Since, by merely touching one—either stool or leg rope—bacteria may be transferred from one to the other, it will be apparent that by handling dirty stools and leg ropes before sitting down to milk and then milking without first having washed the hands—a common practice—bacteria may be transferred to the teats and from them into the milk in the bucket, as it is almost impossible to prevent the hands becoming moistened with milk during milking. Both those objects deserve the same consideration as all other causes of infection in clean milk production. It is a common procedure on the best farms in European countries to have metal stools for the milkers and chain fastenings for the cows, or, if wooden stools are preferred, to clean them daily.

DAIRY FARM ESSENTIALS.

There are two necessary adjuncts to a dairy farm, which are often looked for in vain—a crush and an isolation paddock.

A crush is necessary for the handling of bulls and young stock, but few dairy farms are equipped with one.

An islation paddock is very necessary, but is rarely provided.

How many diseases could be checked if a farmer had a good isolation paddock in which he could place and watch a suspected animal, without any danger of the animal coming into contact with the rest of his herd?

CREAM IN SUMMER.

Frequent and early delivery of cream to butter factories in summer is an important point in dairy practice. Daily delivery is not always possible in some districts, but nothing less than a four times a week delivery should be the rule from October to March, inclusive.

The holding up of supplies and delaying the cream carrier for the purpose of making certain that the morning's cream goes with the cream obtained previously should be avoided. The mixing of newly produced warm cream with older and cooler cream is not infrequently the cause of cream being graded down on delivery at the factory platform.

Dairy farmers would be well advised to have their cream ready for the cream carrier on each morning of delivery. Should the morning's cream not be cooled down and ready on time, that particular cream should be held back for the next delivery; and, if this is done, better factory results will be obtained.

It has been reported that some dairy farmers make a practice of holding up the cream carrier for the purpose abovementioned, and even were this not detrimental to their own cream it is somewhat sefish and unfair to neighbouring farmers who desire their cream to arrive at the factory as early as possible.

As summer has come, the attention of all dairymen is directed to the necessity of supplying cream with a butterfat content of not less than 38 per cent.

A sound summer slogan for all cream suppliers is: ''Frequent and early delivery and test around forty.''

The PIG FARM

Creep Feeding Sucking Pigs.

A FARMER'S aim in rearing pigs is to market them as soon as he can. One way of achieving rapid growth in pigs, and, at the same time, keep breeding sows in good condition is creep feeding of suckers. A litter which has been creep-fed from three weeks of age will usually average 40 lb. per pig or heavier when weaned at eight weeks. Creep feeding means heavier weaners and, therefore, should be practised in every piggery.

Not only do suckers benefit from creep feeding, but sows also benefit indirectly. By obtaining a substantial proportion of their food requirements from the creep, the suckers' demand on the sow's milk supply will be less, besides having a self-weaning effect. The sow is thus given an opportunity to maintain her condition, and she may be mated again after her litter is weaned without any need for a rest and heavy feeding to recover condition.

Suckers which are supplied with an adequate balanced ration, and have access to supplies of the required vitamins and minerals build up a constitution capable of resisting disease more than pigs not fed in this way. Creep feeding thus ensures vigorous growth and health of young pigs.

Creep feeding is simple and does not require elaborate equipment. A hurdle or partition with openings sufficiently large to permit suckers to pass, but which exclude sows, is placed across a corner of the pen. In the hurdled-off space, shallow troughs are placed for food and water. The suckers soon learn to pass through the openings and will take small quantities of food frequently during the day, thus avoiding gorging, with the attendant risk of digestive disorders.

Separated milk, meat meal, pollard and maize, wheat or sorghum, either as whole grain or crushed, are useful for creep feeding. Barley also is very good, but should be crushed before feeding. Where milk is available it may be mixed with a grain meal to form a thin swill, or fed separately. Meat meal may be placed alone in a trough, and the pigs allowed to eat what they require. Young pigs will chew whole grains, except barley. When crushing grains, especially wheat, they should not be made into a fine meal.

No matter what foods are used in the creep, strict cleanliness should be practised. Sour milk should not be left in the troughs and fresh milk poured on top of it. Place in the troughs just enough that will be cleaned up readily each day, and, when necessary, remove any soiled food. Clean water for drinking should be available at all times, especially when meals are being fed.

Pigs make their most rapid and economical gains in proportion to their weight when between three and ten weeks old. Therefore, any assistance at this stage—such as creep feeding, which will assist rapid growth—is worth while. Pigs which have been creep-fed do not suffer a set-back at weaning time, and for these reasons alone, creep feeding is recommended for every piggery where the farmer breeds his own pigs.

PIG FEEDING.

It usually pays the farmer to purchase some concentrated foods to feed in conjunction with home-grown foods, which are relatively inexpensive, but insufficient to feed all his pigs properly. It rarely pays to keep pigs in store condition.

Given good weather conditions during the winter, the milk supply may not fall to any great extent, as forage crops would be available for dairy cattle. Forage crops could also be grown for pigs. Good green forage may be used to replace one-third of the growing pigs' ration and two-thirds of the dry sow's ration; hence, when weather conditions are favourable, an effort should be made to provide a succession of forage crops for pigs, and thus save an appreciable amount of grain, meal, and milk.

Crops suitable for autumn and winter planting include rape, field peas, and oats. Rape is a very quick-growing crop under favourable conditions, and is usually ready for grazing eight to ten weeks after planting. If the pigs are removed from the crop when most of the leaves have been eaten, the crop should make fresh growth, and in this way three or more grazings may be obtained. Field peas are best grazed by pigs when the seed pods are well formed, while the plant is still green; oats should be grazed off by pigs when about 10 in. high.

Wherever practicable, grazing is more satisfactory than cutting the crop and feeding it to pigs in their pens. If the regular pig paddocks can be cultivated, cropped, and fed off, the soil fertility will benefit, much labour and food will be saved, and the sanitation of the piggery will be improved.

ISOLATION PEN FOR SICK PIGS.

The distance between isolation pens for sick pigs and the pig yards or dairy structures is not so important as the relationship of these structures from another point of view. Thus, while advising a minimum distance of, say, 150 feet, it should be emphasised that such isolation pen should be so placed that—

(*a*) No drainage from it can spread to the main sties or any of the dairy buildings; and

(*b*) That if healthy pigs are allowed to wander, the isolation pen should be so guarded that they cannot make contact with it.

Ordinarily, therefore, the isolation pen should be on lower ground, and, if in the paddock in which pigs wander, should be protected by fencing in such a way that healthy pigs cannot come in contact with it.

BUYING A BOAR.

The boar should come from a large, thrifty litter, and be obtained from a reliable breeder. He should be a little more on the compact side than the sow, not too chunky or short, but showing full development at every point, and of a strictly masculine type representing the full type of his breed. He must show quality, smoothness and evenness in every part, have a typical masculine head, with eyes and ears wide apart, the jowl reasonably full and well laid on to the shoulders, which should be smooth and free from wrinkles. He should have a full heart-girth extending well down to the bottom lines, nearly or quite on a level, with as deep a flank as possible. He should possess rather short or medium length legs, with bone of fair size and quality, pasterns short and straight, and the hoofs well set, legs standing square, straight, and well under him. A long, wide and deep ham, and tail well set up are also desirable characteristics.

When selecting a boar the best available should be bought, for during his life he may be the sire of hundreds of pigs, while the sow can only produce a limited number. If the boar is good he will improve the standard of the herd. His selection, therefore, is of very great importance.

BACON PIG WEIGHTS.

The loss of weight in transit of a pig from farm to factory and through the process of slaughter, dressing, and cooling varies with pigs at different weights. Generally lighter weight, unfinished pigs shrink more than heavier weight, prime conditioned stock.

Factors which affect the amount of loss are the size and weight of the pig, the way in which the pig has been fed and "finished," the weather, distance from farm to factory, conformation and condition of the pig, and the amount of food eaten before the pig is weighed alive. There also are variations in animal individuality; for instance, some pigs are of a nervous, excitable disposition, and fret, while others are more contented and are unaffected by the journey.

In extensive tests it has been shown that under conditions similar to those ordinarily ruling in Queensland, pigs weighing 150 lb. to 200 lb. alive on the farm lose about 10 per cent. of this weight in actual transit to the factory, and then another 20 per cent. in dressing and cooling off. Lighter pigs, weighing 100 lb. to 140 lb. alive on farm usually lose approximately 33 per cent. by the time they are dressed and cooled off. While these figures are possibly a fair average, individual pigs vary considerably.

On the sale of about 1,000 bacon pigs from experiments conducted conjointly by the Departments of Agriculture and Stock and Public Instruction in Queensland, results were as follows:—

All pigs were weighed after a twelve-hour fast at the sty. They also were weighed at the factory before slaughter not more than twenty-four hours afterwards and were weighed again in the usual way at the factory after slaughter. The average loss from live weight on the farm to actual cold dressed weight at a factory was 30.5 per cent., varying from 25 per cent. to 34 per cent., with heavier losses on lighter weight stock marketed slightly unfinished for purpose of comparison.

These deductions may be accepted as a guide to the general average of factory deductions in Queensland.

THE FARROWING SOW.

While "in pig" the sow should be given as much freedom as possible, for activity promotes health and good digestion, to the advantage of the sow and her prospective litter.

Her food should not be stinted, but she should be kept in moderate condition. Sows which are too fat at farrowing will probably have trouble in delivery, and may also suffer from many other troubles, of which milk fever is only one. On the other hand, if the sow is kept too short of food she cannot nourish the young pigs properly while carrying them, nor can she suckle them properly when born.

At the time of farrowing a close watch should be kept by the usual attendant—strangers upset the sow—who should not interfere unless there is evidence of trouble in parturition or the sow attempts to bite her young. This sometimes happens when some of the pigs remain to be born and one of those already dropped tries to get to the teats; especially if it squeals, the sow—usually a young one—will seize the piglet in her mouth and quickly squeeze the life out of it. Should she break the skin and taste blood, she may turn on the rest of the litter and eat them. The attendant can prevent this by taking each piglet as it is dropped and putting it aside in a straw-lined box until all are born, when they may be put on to the teats and all will be well.

For the first two weeks after farrowing the sow does not require more food than she received during the last two weeks of pregnancy, but after this the supply should be gradually increased as she requires it.

There is nothing commoner than deficiency diseases in young pigs caused by the absence of the requisite amount of mineral matter in the food. Mineral matter is contained in fish meal, while cod liver oil, with its essential vitamins, stands pre-eminent as a constituent in the food of young pigs. One teaspoonful of cod liver oil twice a day is sufficient for pigs up to ten weeks old.

Draughts, dampness, and uncleanliness, as well as unsuitable food for the mother, will cause scouring, which may lead to death.

Given reasonable care and attention, no trouble should arise, and this little extra care means the difference between a strong, healthy litter and a few stunted, unthrifty runts.

THE BRANDING OF PIGS.

Most pig raisers are now conscious of the necessity for branding pigs offered for sale. Where practicable, the body tattoo method of branding is now in fairly general use. However, there are cases where it is desired to identify live pigs on arrival at bacon factories or saleyards, and for this purpose body tattooing is not suitable; in the absence of a more satisfactory method of branding, the firebrand is used.

The firebranding system is open to abuse in the hands of a careless man, and pigs which have been injured through faulty branding are sometimes noticed at bacon factories and saleyards. Their carcases are so blemished as to lower their value to the trade. The most common mistakes in firebranding are the use of too large a brand, and its application for too long a period—thus causing a deep burn in the skin of the pig which becomes an ugly sore.

Pigs with blemishes caused through faulty branding are not required by the trade. It is frequently observed that exporting buyers at the Cannon Hill saleyards refuse to bid for badly branded pigs. This, of course, reduces competition, and the blemished pigs are sold at a comparatively low price.

Where pigs must be firebranded, a small brand should be used; the pigs should be clean and dry, and the brand used very hot and applied lightly and quickly on the shoulder or neck.

SALT FOR PIGS.

Salt is harmful to pigs only when fed in excess. In tests to determine whether salt has any toxic effect increasing amounts up to 2.5 oz. of salt a day were fed to pigs, without any harmful result, and the animals gained normally in weight. This result was obtained under conditions in which the pigs had free access to water, for if pigs are fed increasing amounts of salt without water the result will be disastrous.

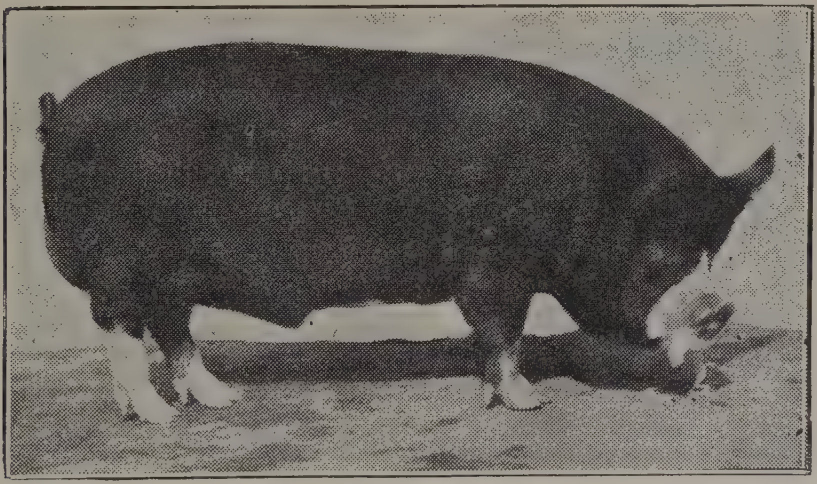


Plate 138.

THE MODERN BERKSHIRE PIG.—A well proportioned animal with lengthy body, light forequarters, and well-developed hams. Colour markings are important, while fine skin and hair give evidence of breeding and constitutional development. This animal was a prominent prize-winner at Southern Shows.

Registered Hatcheries

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
E. J. Blake, Rosewood	Sunnyville ..	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven ..	White Leghorns
A. F. Buchler, Milman	Pincrow ..	White Leghorns
J. Cameron, Oxley Central ..	Cameron's ..	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington ..	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled ..	Rhode Island Reds
B. Cross, Apple Tree Creek, Childers	Spring Hill ..	White Leghorns, Australorps, and Langshans
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield ..	Woodville ..	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla ..	Dixon Bros. ..	White Leghorns
W. Easson, Formosa road, Tingalpa	Grassdale ..	White Leghorns and Anconas
E. O. F. Eckert, Laidley ..	Laidley ..	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	Australorps and White Leghorns
Gisler Bros., Wynnum ..	Gisler Bros. ..	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Grice, Loch Lomond, via Warwick	Kiama ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
S. W. Kay, Cemetery road, Mackay	Kay's	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird ..	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara ..	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	Australorps and White Leghorns
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels ..	Australorps
J. A. Miller. Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, White Leghorns, and Brown Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
S. V. Norup, Beaudesert rd., Cooper's Plains	Norups ..	White Leghorns and Australorps
H. W. and C. E. E. Olsen, Marmor	Squaredeal ..	White Leghorns, Black Leghorns, Australorps, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central ..	Pennefathers ..	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View ..	White Leghorns and Australorps
H. K. Roach, Wyandra ..	Lum Burra ..	Australorps and White Leghorns
W. G. Robertson, Bilson road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa ..	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Smith, Beerwah	Endcliffe	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield	White Leghorns
J. Steckelbruck, The Gap, Ashgrove	Cosy Nook	White Leghorns and Australorps
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's	White Leghorns and Australorps
P. and K. Walsh, Cleveland	Pinklands	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview	White Leghorns
G. A. C. Weaver, Atherton	Weaver's	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby		White Leghorns and Australorps
P. A. Wright, Laidley	Chillowdeane	White Leghorns, Brown Leghorns, and Australorps
R. H. Young, Box 18, Babinda	Reg. Young's	White Leghorns, Australorps, and Brown Leghorns

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MARKING PULLETS.

The marking of early laying pullets provides a practical method of selection where the trap nest is not used.

Records obtained by trap nesting in various parts of the world show that—

(1) Early laying pullets are, as a rule, the highest producers;

(2) Birds that lay late into the autumn and are late in moulting are also high producers.

As the early layers and late moulters are high producers, a marking system will assist in distinguishing between profitable and unprofitable fowls.

In one convenient system of marking, a coloured leg band is placed on the left shank of all pullets which start to lay before six months of age. A band of another colour is attached to the left shank of pullets starting to lay when six and seven months of age, and a third coloured band is used for fowls which commence to lay in the eighth month. Pullets that do not lay until after the eighth month should be culled from the flock, or kept in a pen by themselves, and forced for egg production.

Pullets which are early layers show the following characteristics:—

(1) A large red comb;

(2) An active disposition and a ravenous appetite;

(3) Roominess between the keel and pelvic bones;

(4) An occasional disappearance of the yellow colouration round the vent in some yellow shanked varieties.

In small flocks, individuals showing the abovementioned characteristics may be caught in the nests and then marked.

During the following season, all fowls which were marked as late maturing the previous autumn and moult in December, January, and February may be culled. All the early laying birds, and those that moult after 1st March may be kept for layers or placed in a special breeding pen and mated to a male known to have come from a high laying hen that has been trap nested. In this way the egg production of the offspring may be raised.

The points outlined provide a simple method of selection which will, properly used, raise the level of production in a flock.

Agricultural Notes

Establishing Lucerne.

LUCERNE is grown for hay purposes chiefly in warm districts on deep calcareous soils provided with abundant moisture. In such situations heavy crops are produced over a number of years. Within recent years cultivation of lucerne has been extended into fairly dry districts, but most success may be expected on soils rich in lime and with ample moisture available to the plants.

Land intended for lucerne is best cropped with a cereal, such as wheat, oats, barley, or rye—or panicums and millets—prior to its preparation for lucerne. Stubbles should be cultivated to induce volunteer growths of weeds and other seeds; these should be turned in subsequently by ploughing. For a first cultivation, two deep ploughings should be given at right angles to each other. Moisture should be conserved by frequent cultivation. In dry districts, where a good rainfall cannot always be depended upon at seeding time, fallowing is particularly necessary for the purpose of conserving moisture. The land may therefore be ploughed in late autumn or early winter the year before it is intended to sow. The depth of the ploughing is governed by the character of the soil. Alluvial soils should be ploughed to a depth of about 7 inches, but on other classes of soil of lighter or more porous nature a depth of 4 to 5 inches is sufficient. The ploughed land should then be allowed to lie in the rough state for a month or so and be broken down with harrows after summer rains. During summer the land should be frequently worked with harrows or cultivators so as to allow neither growth of weeds nor the formation of a hard crust on top. If the seed-bed cannot be worked down sufficiently fine with the harrows, a one-way disc cultivator or roller will do all that is necessary. If the land is rolled, it should be harrowed immediately after the rolling. Where the soil surface shows a tendency to dry out just prior to sowing a light ploughing may be given and followed by the harrows. Sowing on top of the harrowed surface, followed either by a light rolling, or by brush harrowing, is a good practice; but if rolling is adopted, a set of light harrows should be used immediately afterwards. Rolling assists in bringing the soil particles in closer contact with the seed and works in the same manner as compressing a partly dried-out sponge.

Lucerne is best sown in April or May, the young plants then being sufficiently well established before the onset of cold weather to enable them to survive. Provided the seed is drilled in, a sowing rate of 12 to 14 lb. per acre is ample, and often too much, in the best lucerne-growing districts. If hand broadcasting is practised, slightly more seed should be used. The rate of seeding should be lighter in dry districts and, for grazing purposes, a seeding of as low as 2 lb. per acre is permissible. Seed sown on the surface should be covered by means of a light harrowing.

Though fertilizers are not used to any considerable extent in the main lucerne-growing areas, many growers have obtained payable results by applying up to 1½ cwt. of superphosphate per acre, either drilled in with the seed or used as a top-dressing. Nitrogenous fertilizers appear unnecessary.

Fully a month or six weeks will pass before the young root system becomes established and the lucerne is fit for its preliminary cutting by the mower. An early mowing, before the young lucerne flowers, acts as a pruning and stimulates the root growth. After the preliminary cutting, a light harrowing may be made if absolutely necessary because of foreign growths.

Often promising stands of lucerne, following good germination, are destroyed through cutworm attacks. Damage at this time is irreparable, or the blank spaces are filled with weeds which considerably lessen the value of the crop. The Paris green-bran cut worm bait broadcast at the rate of 30 lb. per acre gives effective control, provided it is distributed as soon as the depredations of the pest become apparent. The necessary materials should therefore be held in stock on the farm for emergency. Cutworms attack only very young lucerne and intelligently applied baiting is then quite safe. Bait distribution in established crops is undesirable because of the possible risk of stock poisoning.

FERTILIZER AND MANURE.

Some confusion is often caused by the indiscriminate use of the words fertilizer and manure. Although interpretations or definitions may vary in various parts of the world, in Queensland the terms as implied or defined by the Fertilizers Act have the following meanings:—

Fertilizer is any manufactured or natural substance sold or offered for sale for application to the soil for the use of plants and/or remedying any soil deficiency, and which has been prepared in such a way that it is stable, dry, and in a form fit for storage; if insoluble, it must be ground to the required degree of fineness.

Manure is farmyard, sheep, poultry, or stable manure, or other natural organic material of this type which has not been dried or treated in any way to render it fit for sale in the ordinary commercial way as a fertilizer.

THE CONTROL OF SLUGS AND SNAILS.

Slugs and snails are well-known pests of gardens and seed beds in Queensland. They feed by rasping and chewing the foliage, stems, and roots of vegetables or flowering plants. The damage so caused can be quite severe, particularly in young plants and seedlings.

Both pests have a greyish body but while a snail carries a shell on its back into which the body can, if necessary, be withdrawn, a slug has no such protective device. The head bears two pairs of sensory tentacles. A feature common to both is the "foot," a conspicuous muscular structure possessing glands which secrete the familiar slime. Slime glands occur elsewhere on the body and the secretion both assists movement and serves to throw off irritating substances which may foul the body of the animal.

Feeding takes place at night. During the day both slugs and snails take shelter in the shade of low-growing shrubs or plants and under boards or logs.

Systematic collection and destruction of these pests will help to keep them under control, and one way of simplifying these operations is to place boards or large cabbage leaves on the ground in infested areas. Slugs and snails sheltering under the boards can be destroyed the following day; those feeding on the cabbage leaves, to which they are very partial, can better be destroyed at night.

Metaldehyde is both very attractive and highly poisonous to these pests. "Meta," a product sold primarily for heating small portable stoves, is a commercial metaldehyde suitable for use in control measures. A metaldehyde-bran bait is prepared by mixing three tablets of "Meta" ground to a powder with 1 lb. dry bran and moistening the product with one-half cup of water. The bait is distributed over the more heavily-infested areas, either broadcast or in small heaps containing a teaspoonful of bait, at 2-foot intervals. Ready-mixed metaldehyde baits are now purchasable in Queensland and these should normally give reasonably good results.

Metaldehyde is somewhat toxic to human beings and is, as its earlier use for heating purposes suggests, very inflammable. Reasonable care should therefore be exercised when using it—e.g., In areas to which children and pet animals have access, the bait should be broadcast and not distributed in heaps.

CLOVERS ON THE COAST.

A marked increase in milk production in late winter and spring when white clover is plentiful in the pastures is a common experience in coastal dairying districts. Unfortunately, it is not every year that weather conditions are favourable for the development of a good growth of clover in unimproved paspalum pastures.

Generally, the requirements of clovers are a fertile and not too acid soil and a fair supply of soil moisture. Where white clover is naturally abundant in paspalum pastures it may be taken for granted that its requirements are supplied, but it is true that the production of thousands of acres of paspalum pasture could be improved by the encouragement of clover growth.

Soils which are distinctly acid can only be made suitable for clover growth by the use of lime. If the fertility of the soil has been lowered by many years of grazing, it is advisable either to renovate with the plough or paspalum renovator and top-dress with fertilizers. On suitable areas it may be preferable to plough out the pasture and grow a green manure or some other form of crop prior to resowing the area with a mixture of grass and clover seeds. Renovation and green-manuring practices, in addition to increasing soil fertility, also tend to increase the water-retaining properties of the soil.

In all cases where pasture has been renovated, or where new permanent pastures are to be sown, it is advisable to add clover seed to the pasture. The clovers which have proved themselves of outstanding usefulness for incorporation in permanent pastures are white clover and red clover, and both should be included in permanent pasture sowings on the sub-tropical coast. White clover provides good grazing from about August until November, while red clover makes the bulk of its growth from September till March. Compared with white clover, red clover is a short-lived plant and dies out in a pasture within two or three years. It is of great use, however, in providing feed during the first year while the white clover is establishing itself.

When sowing on renovated paspalum or in new pasture mixtures, about 1 lb. per acre of each of the clovers should be used. New Zealand strains of white clover are superior to European or local strains of which commercial seed is available; the best seed to use is New Zealand Government-certified white clover seed. New Zealand strains of red clover also are preferable to other commercial types.

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CEMENTED BAG BUILDINGS.

The chaff and cement bag can be turned to good use in the building of fowl houses or similar farm buildings of light construction according to the following plan, which has proved successful in practice.

A framework of timber is first of all built up, after which wheat or cement bags are opened out and stretched very tightly over it, being nailed down with ⅝-inch clout tacks. Next, a mixture is made up as follows:—

Water, 1¼ gallons,
Cement, 12 lb.,
Lime, 2 lb.,
Salt, 1 lb.,
Alum, ½ lb.

(In damp or wet weather use 1 pint less of water.)

Sieve the salt and lime together through a fine sieve—to thoroughly mix the materials and get rid of any big lumps—add the water and then the cement—stirring while adding—and finally the alum. Wet the stretched bags with water and apply the mixture without delay, using a fairly stiff brush, first on the outside, and then on the inside. Before the mixture sets, but after the initial wetness disappears, apply a second coat to the outside. When this sets, the bags will be quite hard and stiff, somewhat like plaster board. Subsequent coatings will, of course, make a stronger board.

The cost of the process, including bags for the foundations, works out at about 8d. a square yard. From this it will be seen that it is a very cheap and easy method of construction. Sheds built according to this plan three years ago show no signs of disintegration.

THE TRENCH SILO.

That interest is being taken by more farmers in the conservation of stock foods is shown by the number of pit silos being constructed for the storage of the summer fodder surplus. There also is, however, some evidence of apparent apathy in respect of the establishment of fodder reserves. A good way of conserving fodder is to place it in a trench silo, and the attention of dairy farmers is directed towards this cheap and effective method of storage.

A few important points in the construction, method of filling, and emptying of the trench are briefly given for the benefit of interested farmers.

Select a reasonably level and well-drained site as near the place of feeding as conveniently possible. Mark it out according to the capacity required. A trench 30 feet in length, 8 feet wide at bottom, 12 feet at top, and 8 feet deep, having an outslope at each end of 1 in 3 grade, would hold approximately 45 tons. By altering the length and retaining the other measurements, the capacity may be increased a ton for each additional foot length.

To construct the trench, excavate according to the desired dimensions, using plough and scoop and depositing the spoil along either side to back up the logs, which should be placed lengthwise to raise the walls 2 feet above the surface. Complete the job by trimming the walls smooth with mattock and spade.

The cost of construction involves labour only, and the time taken would vary according to the nature of the ground. In ordinary circumstances, two men equipped with suitable plant should excavate a trench of 45-ton capacity in about two or three days.

In filling the trench silo there is no necessity to chaff the material, full-length crops being loaded in the field and drawn through the trench, off-tipped, and spread in even layers lengthwise, the empty vehicle passing out the other end. Thus each layer is consolidated as a result of the trampling of the horses' action throughout the whole filling process.

Should the crop be at all dry through over-maturity or as a result of frost, a sprinkling of water may be added during the filling process. The filling should continue well above the surface, forming a parapet of about 3 feet high, sloped towards the sides of the trench.

Complete the filling by covering it with grass well watered, finally topping with a 9-inch to a 12-inch layer of earth.

The material so stored will be fit to use as silage in from two to three months after filling, if so desired, or it may be safely stored for many years without undue deterioration or loss.

To remove the silage for use, the trench should be opened up at one end, taking the earth and grass covering from a portion only as required, and cutting down vertically with a sharp implement, such as a spade or hay knife. When a complete face section from top to bottom has been removed, an adze may be used to slice off additional material in a semi-chaffed or short-chopped form, resulting in its being in a more acceptable condition for feeding direct to stock without further preparation.

The silage may be fed as it is to practically all classes of stock. For cows in full milk, however, better results are obtained by the addition of a small quantity of protein-rich fodder and concentrate, such as lucerne chaff and cottonseed meal.

Further particulars about silos and silage may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

A LAND SURVEY FROM THE AIR.

Excellent results are expected from a detailed survey from the air of the whole of the Murrumbidgee irrigation areas. The scheme is the most ambitious of its kind ever undertaken in Australia, enabling accurate maps to be made in a few hours that would take years to complete under the old methods. The district has been photographed in a series of parallel lines from a height of 5,000 feet. The photographs of each farm have been enlarged so that they coincide exactly with the original contour survey. They provide an amazingly clear plan of the plantings of trees and vines from which the position, size, and even the health of individual trees may be clearly seen. The work is being supplemented by a ground survey staff, so that particulars not available from aerial photographs may be accurately recorded.

The farmers concerned are co-operating readily in this huge undertaking.

Horticultural
Notes

Cabbage-growing for Market.

THE cabbage is one of the most important vegetables for the market gardener. It grows best in the cooler districts, but by carefully selecting varieties the crop may be grown in most parts of Queensland.

The seed should be sown in beds of well-drained, deeply and thoroughly worked soil. The soil, if heavy, should be improved by the addition of sand or decayed vegetable matter; if poor and sandy, the addition of a loamy soil or well-rotted manure will be beneficial.

The surface of the bed should be fertilized and firmed, and the seed sown thinly in shallow drills about 4 inches apart. After sowing, mulch the bed with well-rotted leaf mould to prevent excessive evaporation of moisture.

The seed-bed should be watered regularly, for a check on the growth of young seedlings is often followed by unsatisfactory results.

When large enough to handle, the seedlings should be thinned to an inch apart, for if grown too thickly they develop into long, spindly, weak plants.

Shading during the hottest part of the day is often necessary, but this shade should be removed as soon as the plants are strong enough to withstand the heat. Overshading also produces spindly plants. Approximately 1 lb. of seed will provide sufficient plants for an acre of cabbage.

In about six weeks the young plants should be large enough for transplanting. They may then be hardened off by restricting water supplies for a day or two before their removal to the field. Transplanting should be done in cloudy or showery weather, but if weather conditions are unfavourable the young seedlings should be watered in, and, as a further precaution, the top half of the leaves may be trimmed off to lessen transpiration until the root system is established.

Loosening of the soil in the seed-bed with a fork before lifting the plants helps to save many of the small roots. If the bed has been well soaked previously, the plants will lift with a ball of soil adhering to the roots, which will help to keep them moist.

The roots of the young plants should be kept damp after removal from the bed, and this may be done by standing them in a bucket containing a puddle of soil and water.

In planting, a hole is first made in the ground with a dibble—an old spade or digging fork handle is suitable. The hole should be only deep enough to allow the roots of the seedling to reach the bottom of the hole. Turn in a little earth, and then draw the plant slightly upwards before pressing the soil firmly around it. This ensures that the main root will not be doubled up.

The plants should be in rows 3 feet apart; in the rows the smaller varieties should be spaced 2½ feet and the larger varieties 3 feet apart. The growth of cabbages should on no account be checked. Regular cultivation and watering are, therefore, essential.

The right variety should be selected for different times of the year. Winter-planting types should be early and quick maturing..

In the cooler areas, seed of the early varieties is sown during autumn. Main crop varieties are sown between August and December. The coastal districts are best suited to the winter crop.

Cabbage should be marketed as soon as possible after cutting, and only good, firm-hearted vegetables should be sent for sale. Care in handling is essential, and when placed in bags for railing they should be packed as firmly as possible.

Recommended varieties are:—

Early.—Early Allhead and Early Drumhead, both of which are large, early, and quick growers.

Main Crop.—Succession is the most popular variety, and may be grown almost any time. It is a good large Drumhead type.

Surehead is slightly larger than Succession. It is hardy, and may be planted closer in the rows, as it has fewer outside leaves.

THE CONTROL OF PINK WAX SCALE IN CITRUS ORCHARDS.

Pink wax scale is of greatest importance in the coastal regions, where it is very prevalent, but it may also be found in appreciable numbers in inland areas. It has a considerable number of host plants other than citrus, but it is only on citrus trees that it becomes of any economic importance.

Young scales (crawlers) make their appearance on the trees in early December and early March. In this stage they are minute, reddish-coloured creatures, and may be seen moving actively about amongst the old scales on leaves and twigs. After a short period of activity, the crawlers settle down and commence feeding. At first they secrete a white covering, which is gradually replaced by the typical pink waxy secretion. The young scales are quite conspicuous along the midribs of leaves, on leaf petioles and on young twigs.

While in the crawling stage the young scales are easily dislodged and blown about by the wind. Thus, during the breeding season, there is a continual migration into orchards from other host plants, which are invariably growing in the vicinity.

The most essential point in the control of this species is to apply the scalicide at the right time. If the migration from outside sources into the orchard has not been practically completed before treatment, the subsequent infestation may be so considerable as to nullify the effects of the application. This is a case in which it is better to be a little late rather than too early. Generally speaking, it may be said that the right time to spray is when the typical young scales in the orchard are about the size of an ordinary pin's head.

The most satisfactory spray consists of 5 lb. of high-grade laundry soap, 12-14 lb. of clean fresh washing soda, and 75 gallons of water. A washing soda wash containing 1½ lb. of clean, fresh washing soda to 4 gallons of water is very effective, but inclined to be severe on the trees. The resin-caustic soda-fish oil spray is also effective, and has certain advantages in that it kills much older scales than either of the other mixtures. The use of this spray, however, is inadvisable when the temperature is in excess of 90 deg. Fahr. Fumigation with hydrocyanic acid gas may also be used with a fair measure of success.

Pink wax is not a particularly harmful scale in itself, but it so weakens the affected parts as to predispose them to injury from other causes. Also, it is almost invariably accompanied by a copious growth of sooty mould or fumagine, which, as most orchardists know, is most objectionable, especially when on the fruit. Sooty mould cannot exist in the absence of pink wax or some other insect to provide it with food material. Therefore, to control pink wax, the commonest source of such food material is to ensure comparative freedom from sooty mould.

FRENCH BEANS.

A considerable variety of beans is grown in Queensland, but certain varieties are outstandingly more popular than others. The Canadian Wonder is an all-round favourite on the market, but because of its susceptibility to disease is not grown to the same extent now as formerly. Brown Beauty is very popular in North Coast districts, where it is known as a hardy and prolific variety. Stayley's Surprise also is grown extensively, and is usually planted two or three weeks earlier than Brown Beauty. Other varieties grown to a lesser extent are Feltham's Prolific and Burnley Selection, the latter being a new variety supposedly blight-resistant.

Plantings may be made at almost any time of the year, depending on local conditions in each district. On the North Coast, on areas free from frost, June and July are the two main months for planting. Other districts prefer spring or summer planting.

In some parts of the State in the past great difficulty has been experienced in raising a crop during the hot months because of the ravages of the Bean Fly, but experiments have shown that it is possible to obtain at least partial control of this pest by spraying. Information on this and other pests and diseases of beans can be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

In preparing land for general market garden crops along with cultivation, they generally require the free use of well-rotted stable or other manure, but in the case of beans the application of heavy dressing of such manures often results in the production of an over-abundance of foliage and poor setting of pods. Beans grow best in a well-cultivated soil, and preferably one that has been manured for a preceding crop. Well-drained clayey loams yield the best result.

Fertilizers should be freely used. There are on the market several commercial complete fertilizers for beans, sold by well-known and reputable firms, which can be purchased with confidence. The customary dressing is 6 cwt. to 8 cwt. per acre. It should be applied in the bottom of the drills, covered with about an inch of soil before planting the seed.

Planting is usually done by striking out drills about 6 in. deep and, after applying the fertilizer and lightly covering this with soil, dropping the seed by hand and again raking in a light covering of soil. During subsequent cultivation the drills will gradually fill up. The rows may be 2 ft. 6 in. to 3 ft. apart, and the seeds spaced 6 in. to 8 in. in the rows. Thirty-five lb. of small and 52 lb. of large seed is sufficient to plant an acre.

Horse cultivation is usually carried out, but it is not advisable to commence this work in the early morning, or at any time when the plants are wet, as the spores of certain diseases are more easily spread under these conditions.

Weeds should be kept in check, as they will seriously affect the growth of the crop.

The maximum output of beans can only be gained by picking thoroughly as they become fit, that is when young and tender; otherwise they will begin to form seed, and the plants will cease to bear marketable beans.

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BANANAS AS A FERTILIZER.

The use of bananas as a fertilizer is something new. A cargo of fruit recently consigned to Britain went bad on the voyage. When the shipment was opened up, the question was what was to be done about it. A Scottish farmer was not long in settling it. He took delivery of thousands of cases of the condemned bananas for manuring his land, a farm alongside the Firth of Forth. No doubt, the new sort of fertilizer proved useful in the production of vegetables for the Navy. Certainly, to a Scotsman waste is a woeful sin.

Incidentally, during the last war we visited a place in Scotland where every farmer had done remarkably well out of supplying green vegetables to the Navy. So, in nature's wonderful way, bad bananas might easily be converted into good cabbage.

THE FRUIT MARKET.

J. H. GREGORY, Instructor in Fruit Packing.

BRISBANE prices for most fruit and vegetables are on a par with Sydney and growers are realising good values for most produce.

Stone fruits are now in full supply and quality fruit is selling readily. These fruits have affected the demand for tropical fruits somewhat, so prices for pineapples and bananas, except for special lines, have eased somewhat.

On the Sydney market ''blister'' is still prevalent. Why growers do not cut their pineapples for distant markets is a mystery. Cutting with cleanliness and careful handling would go a long way to prevent ''blister.'' The same thing applies to bananas. The best packs in the world are useless if the fruit has been ruined by bad handling before packing. Often excellent packs are badly affected with ''black-end'' through the necks of the fruit being wrenched while breaking from the hands.

Mangoes are now coming in in increasing quantities. Only special varieties should be sent to Southern markets.

Ruling market prices during the last week of November, 1940, were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 5s. 6d. to 6s. 6d.; Sixes, 6s. to 10s.; Sevens, 8s. to 14s.; Eights, 10s. to 15s.

Sydney.—Cavendish: Sixes, 6s. to 16s.

Melbourne.—Cavendish: Sixes, 6s. to 9s.; Sevens, 8s. to 11s.; Eights, 10s. to 13s.

Brisbane.—Lady's Finger: ½d. to 7d. per dozen.

Brisbane.—Sugars: 1½d. to 4½d. per dozen.

Pineapples.

Brisbane.—Smoothleaf: 1s. 6d. to 6s. 6d. per dozen; 5s. to 8s. per case. Ripleys: 1s. 6d. to 6s. per dozen; 7s. to 9s. per case. Northern Roughs: 7s. to 10s.

Sydney.—Smoothleaf: 6s. to 10s.

Melbourne.—Smoothleaf: 8s. to 10s.

Papaws.

Brisbane.—Yarwun: 5s. to 6s. tropical case. Specials higher. Locals: 2s. to 3s. bushel. Gunalda, 2s. to 4s. 6d. bushel.

Sydney.—8s. to 12s.

Melbourne.—7s. to 10s.

Mangoes.

Brisbane.—5s. to 8s. bushel.

Avocados.

Sydney.—10s. to 12s. half bushel.

Passion Fruit.

Brisbane.—Firsts, 6s. to 8s.; Seconds, 4s. to 5s.

Sydney.—6s. to 12s.

Melbourne.—14s. to 22s.

CITRUS FRUITS.

Oranges.

Brisbane.—Imported, 7s. to 12s. bushel case.

Melbourne.—Valencia, 6s. to 10s. bushel; Navels, 6s. to 14s. bushel; Common, 5s. to 10s. bushel.

Grapefruit.

Brisbane.—Imported, 11s. to 14s. bushel.

Lemons.

Brisbane.—Gayndah, 15s. to 18s.; Locals, 8s. to 15s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—French Crab, 3s. to 7s.; Yates, 3s. to 10s.; Granny Smith, 8s. to 13s.; Sturmer, 5s. to 9s.; Democrat, 5s. to 12s. Many lines faulty.

Pears.

Brisbane.—Broom Park, 6s. to 10s.; Josephines, 7s. to 15s. Winter Cole, 7s. to 16s.

Peaches.

Brisbane.—Mayflower, 6s. to 8s.; Sneyds, 2s. 6d. to 5s. 6d.

Apricots.

Brisbane.—Stanthorpe, 5s. to 10s.; Warwick, 3s. to 8s.

Plums.

Brisbane.—Wilsons, 8s. to 10s. Patterson, 5s. to 8s.

Cherries.

Brisbane.—Stanthorpe, 8s. to 10s.; New South Wales, 7s. to 10s.

Tomatoes.

Brisbane.—Ripe, 8s. to 10s.; Coloured, 10s. to 13s.; Green, 8s. to 10s.; Inferior down to 3s.

Sydney.—4s. to 8s. per case.

MISCELLANEOUS VEGETABLES, ETC.

Watermelons.—Large, 15s. to 30s. dozen; small, 4s. to 10s. dozen.

Rockmelons.—5s. to 9s. dozen.

Cucumbers.—Locals, 5s. to 10s. bushel.

Pumpkins.—Brisbane, 21s. to 24s. bag. Sydney, 25s. to 30s. cwt. Melbourne, 30s. to 35s. bag.

Marrows.—Brisbane, 8s. to 9s. tropical case. Melbourne, 10s. to 14s. double case.

Lettuce.—1s. to 2s. dozen; 2s. to 4s. case. The tropical fruit case is best for marketing lettuce.

Cabbages.—Locals, 3s. to 10s. dozen Stanthorpe, 10s. to 16s. bag.

Beans.—Brisbane, 6s. to 14s. bag.

Peas.—Brisbane, 6s. to 14s. bag. Melbourne, 12s. to 20s. bag.

Beetroot.—4d. to 1s. bundle.

Parsnips.—9d. to 1s. 6d. bundle.

Carrots.—6d. to 1s. 3d. bundle.

Rhubarb.—1s. to 1s. 3d. bundle.

* * *

GOOD SEED MEANS GOOD CROPS.

Successful crop production depends on several important factors, including seed, soil, farming methods, and seasonal conditions. Of these factors the selection of sound seed is entirely in the hands of the grower. The farmer alone is responsible for the quality or character of the seed planted. If the results obtained are not up to expectations, then the farmer must take all the blame. Successful cropping depends on the use of "good, pure seed." This term means seed which is well-matured, large and plump, free from weed seeds, relatively high in germination, and true to variety. The term "good, pure seed" involves, in addition, another factor of vital importance and that is suitability of the locality in which it is planted. It is plainly no use wasting good seed in the wrong paddock.

If any doubt exists in the mind of any farmer as to the quality of the seed he has bought or is thinking of buying, the seed specialists of the Department of Agriculture and Stock are always willing to give him any assistance within their power. All he has to do is to consult them or send a sample of the seed to departmental advisers, who are keen to help the farmer in every way they can.

NEW DIRECTOR OF VETERINARY SERVICES.

Plate 139.
PROFESSOR H. R. SEDDON, D.V.Sc.

Professor H. R. Seddon, who has been appointed Director of Veterinary Services in the Department of Agriculture and Stock, is a native of New Zealand. For three years he was a cadet in the Veterinary Laboratory, New Zealand Department of Agriculture. In 1909 he entered the Melbourne University as a student and graduated four years later with the B.V.Sc. degree. He gained his doctorate from the same University in 1920. From 1913 to 1922—except for a period on active service with the Australian Imperial Force in Palestine and Syria, during which he attained the rank of captain, and six months' special leave study in Great Britain—Dr. Seddon held a lectureship at the Melbourne University Veterinary School and was consulting veterinary pathologist to the Victorian Department of Agriculture. From 1923 to 1936 he was Director of Veterinary Research in the Department of Agriculture, New South Wales, and, for a time, an acting lecturer in the Sydney University.

When the School of Veterinary Science within the University of Queensland was established in 1936, Dr. Seddon was appointed to its first professorship and also Dean of his Faculty. He has occupied the presidential chair of several learned societies, and is a Fellow of the Australian National Research Council and a member of the Queensland Committee of the Council for Scientific and Industrial Research. In 1934 he was chosen to deliver the Kendall Oration at Canberra. Before coming to Queensland he was the Director of the Veterinary Research Station at Glenfield, New South Wales.

Dr. Seddon has been an Australian representative at international conferences on problems of animal health and husbandry, visiting Great Britain, Europe, and South Africa in that capacity. These conferences included the International Veterinary Congress, the World Poultry Congress, and the London Wool Conference.

Possessing a broad and deep knowledge of stock problems and of the progress of veterinary science within recent years—especially through his association, as an officer and otherwise, with the State Departments of Agriculture of the Commonwealth, and also of New Zealand—Dr. Seddon has had published over one hundred papers on a wide variety of subjects in British and Australian scientific journals, to which his most important contributions were on contagious abortion in cattle, the sheep blowfly, botulism and parasitic diseases. He also has undertaken extensive investigations on plants poisonous to stock, on which he is an acknowledged authority.

For four years prior to his present appointment Dr. Seddon was Veterinary Adviser to the Department of Agriculture and Stock.

PROGRESS IN DAIRY RESEARCH.

A new butter-testing laboratory—the third now in operation—has been opened at Hamilton, and is a further indication of continued progress in dairy research. The substitution of a butter improvement service for the standardisation service of former years was another notable advance in the course of the year. The cheese improvement campaign, by which substantial results have been achieved, was continued, and the regular services of the Department, the scope and value of which are widely acknowledged by the dairy industry, were well maintained throughout the year just closing.

Brisbane Show Champions (1940).

Plate 140.
Champion A.I.S. Cow.—Trevor Hill Princess II., the property of Messrs. J. Phillips and Sons.

Plate 141.
Champion Butterfat Cow.—Alfa Vale Gentle II., the property of Mr. W. Thompson.

Plate 142.

AUSTRALIAN ILLAWARRA SHORTHORNS, TEAM OF FOUR COWS (A.I.S.).—From right—Alfa Vale Gentle II., Model IV., Model XI., Model II.—the property of Mr. W. H. Thompson.

Plate 143.

CHAMPION AYRSHIRE BULL.—Myola Bonnie Duke, the property of Mr. G. Norgaard.

Plate 144.
Champion Jersey Bull.—Oxford Brown Victory, the property of Mrs. M. Stanton.

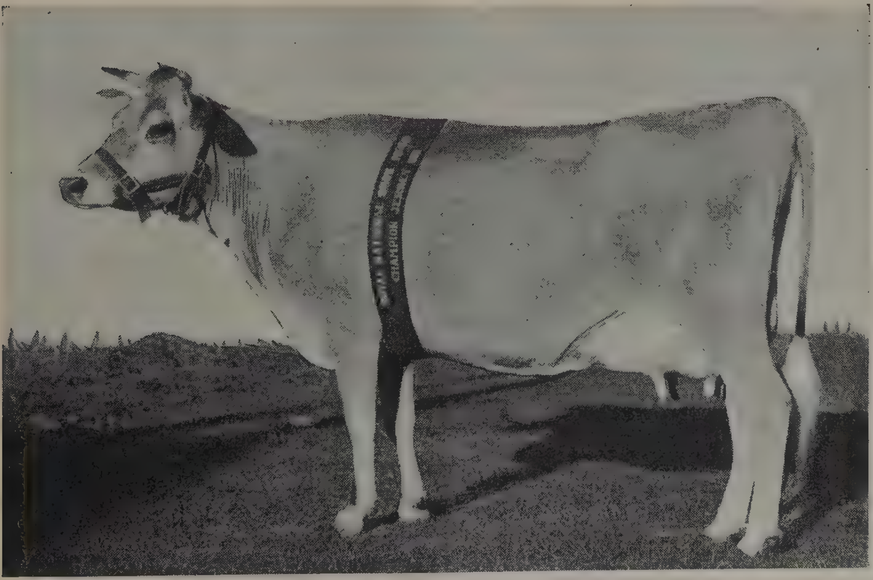

Plate 145.
Champion Jersey Cow.—Rush Princess, the property of Messrs. J. Sinnamon and Sons.

Plate 146.
CHAMPION FRIESIAN BULL.—Burnbrae Joecho Dekol, the property of Mr. M. C. Pearce.

Plate 147.
CHAMPION FRIESIAN COW.—Glendalough Corndale, the property of Hickey and Sons Pty. Ltd.

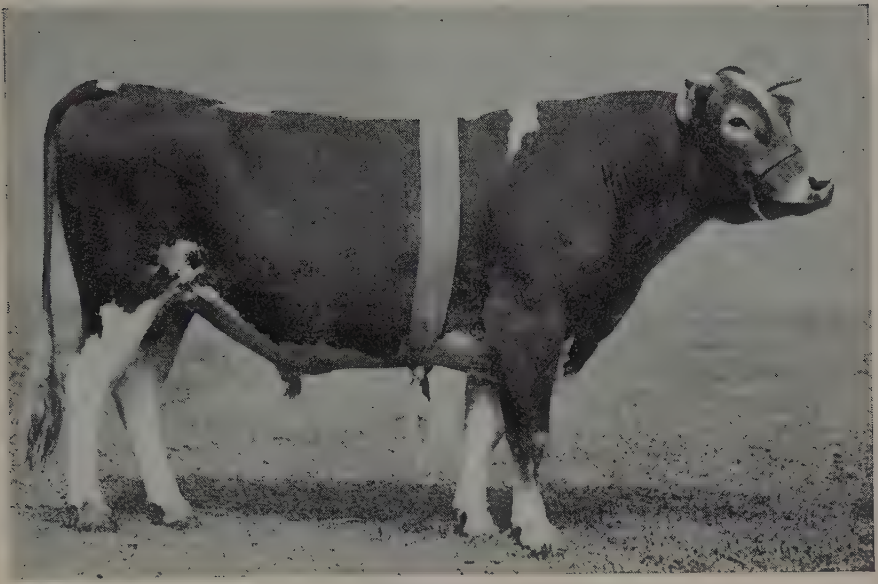

Plate 148.

Champion Guernsey Bull.—Fairfield Martin, the property of Mr. F. A. Stimpson.

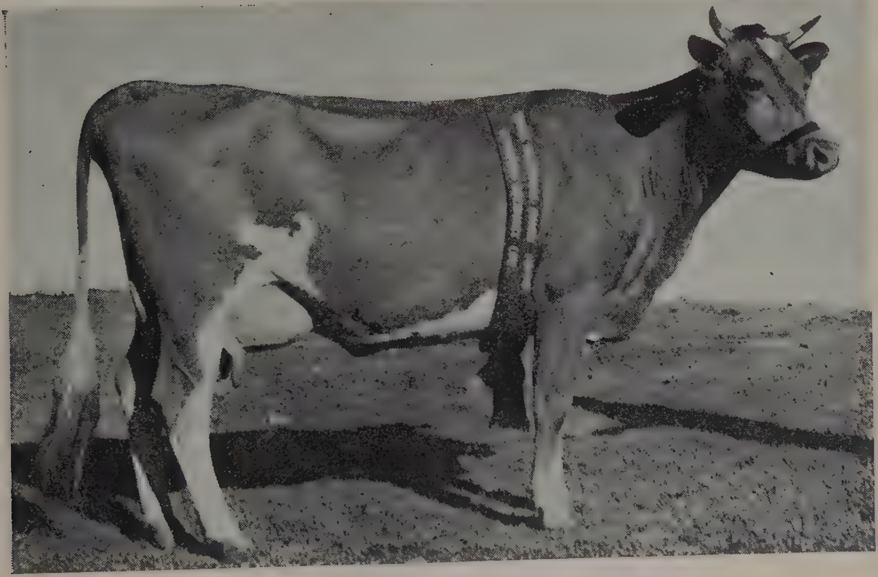

Plate 149.

Champion Guernsey Cow.—Laureldale Poppy, the property of Mr. W. Cook.

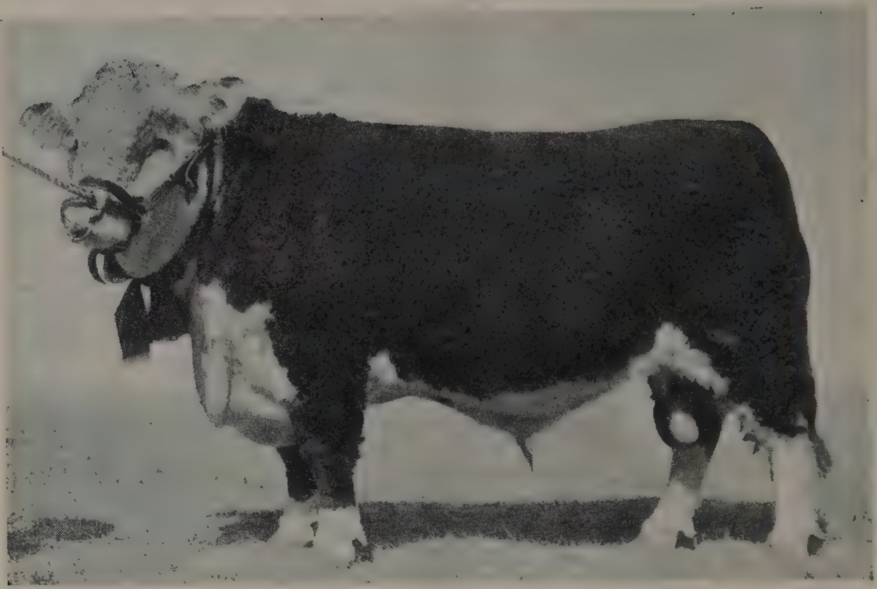

Plate 150.
CHAMPION POLLED HEREFORD BULL.—Milton Ambassador, the property of Mr. J. Sparkes.

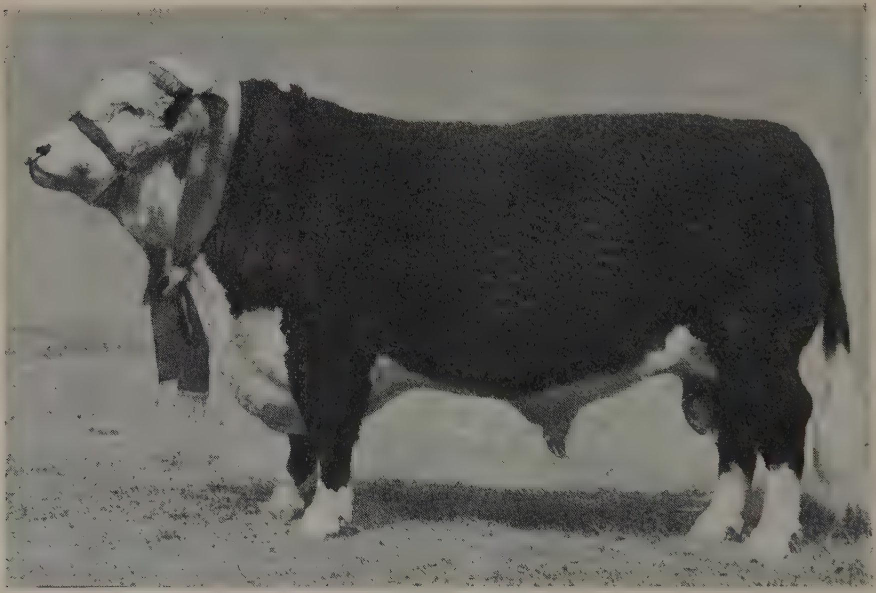

Plate 151.
CHAMPION HEREFORD BULL.—Myall Dreadnought, the property of Messrs. Fenwick Bros.

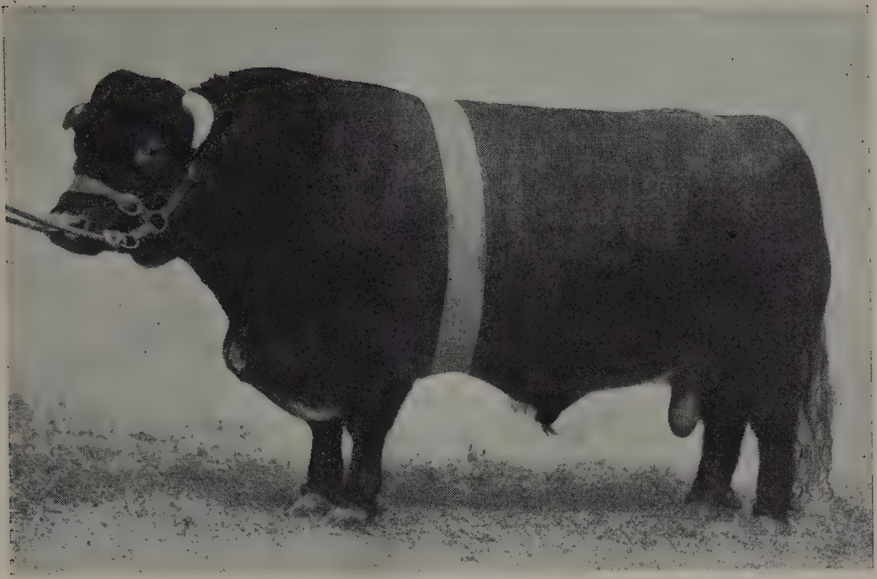

Plate 152.

Champion Shorthorn Bull.—Calrossie Masterpiece, the property of Mr. H. C. Taylor.

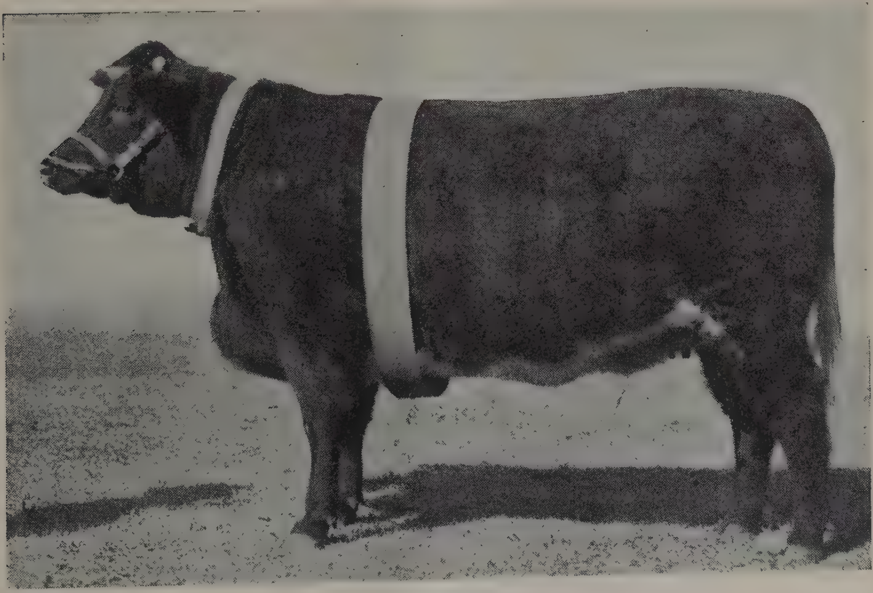

Plate 153.

Champion Shorthorn Cow.—Peel Fairy, the property of the Peel River Land and Mineral Co. Ltd.

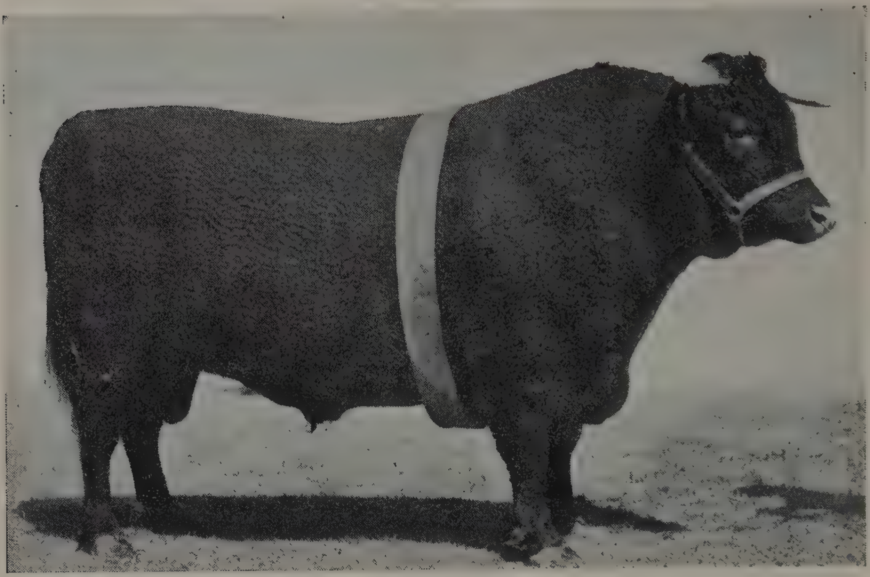

Plate 154.
CHAMPION DEVON BULL.—Devon Court Snug 1661st., the property of Mr. R. A. Howell.

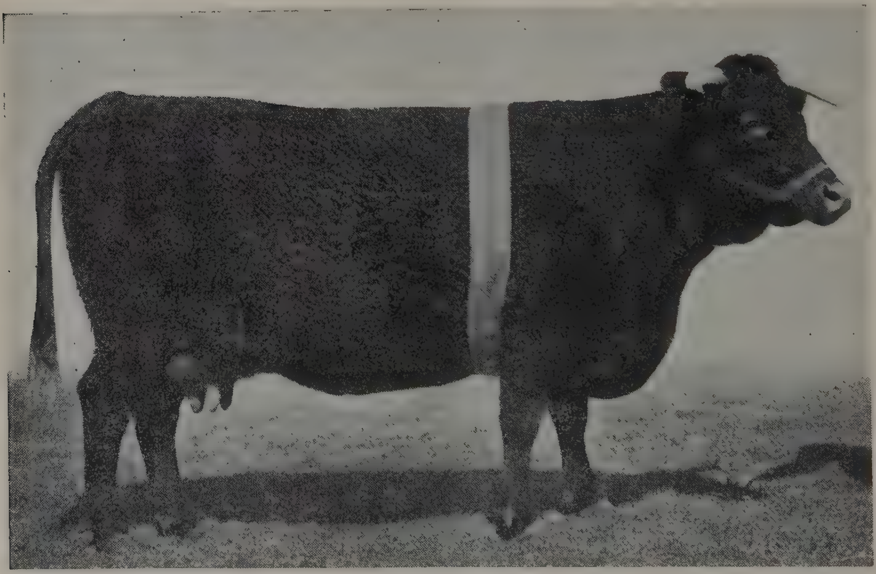

Plate 155.
CHAMPION DEVON COW.—Devon Court Lusty 1105, the property of Mr. R. A. Howell.

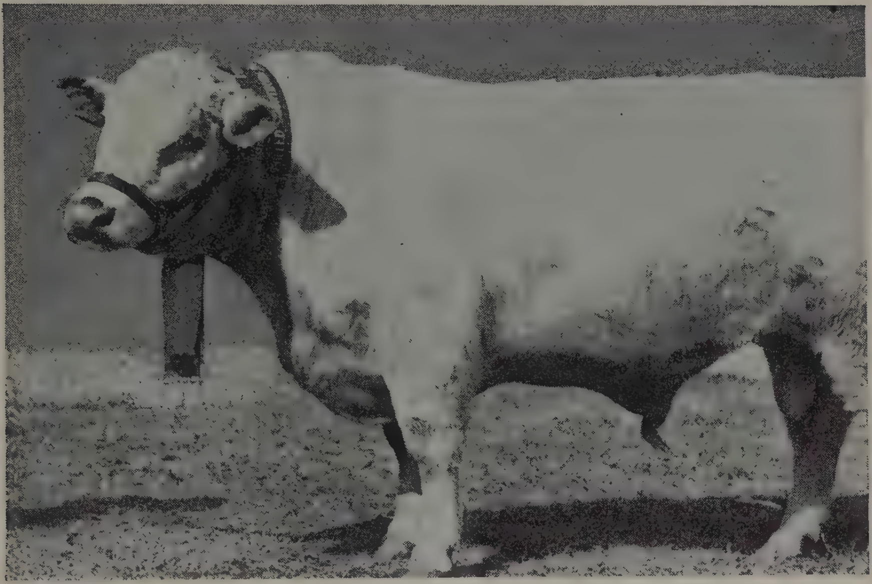

Plate 156.

Champion Polled Shorthorn Bull.—Gundibri Laddie II., the property of Gundibri Estate Co. Pty. Ltd.

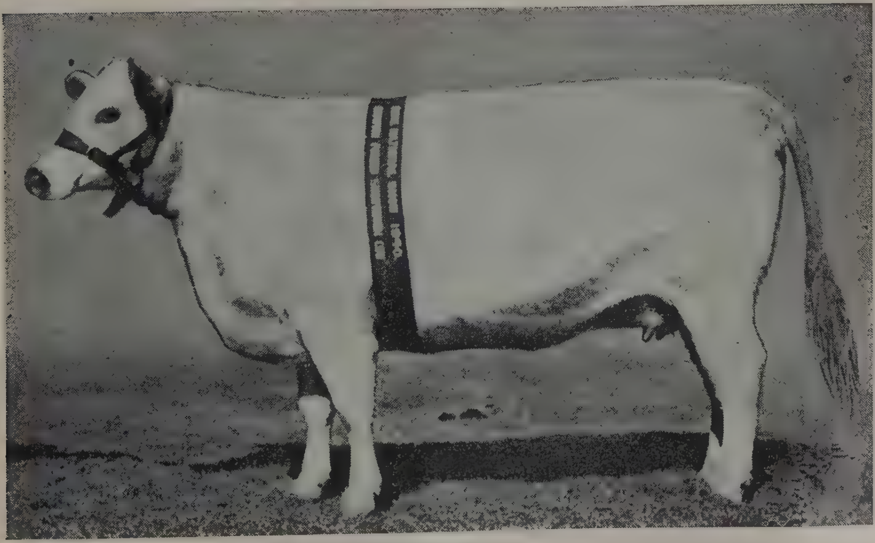

Plate 157.

Champion Polled Shorthorn Cow.—Milton's Cumberland Bess, the property of Mr. T. J. Scrymgeour.

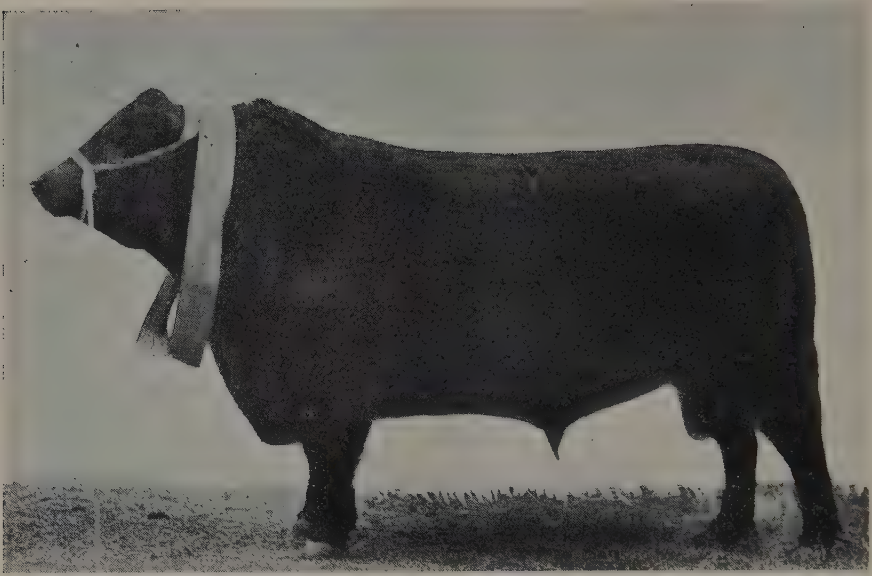

Plate 158.
CHAMPION ABERDEEN ANGUS BULL.—Booroomooka Hector, the property of Mr. H. G. Munro.

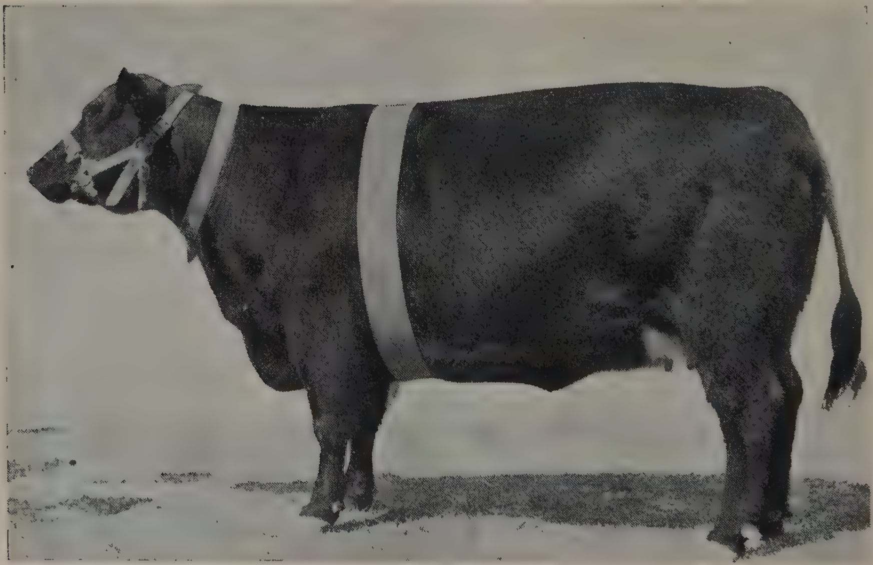

Plate 159.
CHAMPION ABERDEEN ANGUS COW.—Elegosa of Ballindalloch, the property of Mr. J. M. Newman.

Registered Stallions.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under "*The Stallions Registration Acts*, 1923 *to* 1934," during the year 1940-41:—

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1940-41.

Name.	No.	Age.	Colour.	Owner.
Acolite	2689	Aged	Bay	C. K. Shannon, Theresa Downs, Capella
Acorban	2626	5	Bay	W. F. James, Coorparoo
Air Pilot	2690	Aged	Bay	Dennis Bros., Epping Forest, Clermont
Apple Snow	2541	6	Bay	E. L. Ramsay, Cambooya
Assegai	2627	6	Bay	E. L. Ramsay, Cambooya
Balamar	2507	5	Chestnut	Mrs. R. J. Toohey, Calingunee, Goondiwindi
Black Beau	2519	5	Black	M. J. Stenzel, Mt. Alford, Boonah
Black Buck	2542	5	Brown	E. F. Postle, Southbrook
Blackthorn	2628	5	Black	M. Kenny, care of C. Smithson, Manson road, Hendra
Boy Circle	2657	5	Chestnut	W. Squire, Box 12, P.O., Ravenswood
Bright	2616	5	Bay	C. Hopf, Wolvi
Brownlock	2691	Aged	Brown	W. R. Tindale, Monteagle, Clermont
Bulltop	2631	6	Brown	C. McConachy, Herries street, Toowoomba
Cannon Fly	2543	5	Chestnut	J. McGreevy, Anduramba, Crow's Nest
Cannon's Pride	2544	5	Chestnut	G. V. Hess, Kaimkillenbun
Capple Bar	2574	5	Bay	H. G. Stockhill, Corrunovan, Proston
Carradale	2692	Aged	Brown	Logan Downs Pastoral Co., Logan Downs, Clermont
Cathartes	2693	Aged	Bay	Clark and Tait, Gordon Downs, Capella
Charcoal	2694	Aged	Brown	Drynan Bros. Disney, Clermont
Cinzano	2518	Aged	Bay or brown	A. Fitzgerald, Mangle, Boggabilla
Clansman	2597	5	Bay	Cook and Cook, Wandoo, Koumala
Coolwood	2630	6	Bay	P. P. Venaglia, Rous street, Hendra
Coonam Valley	2575	6	Bay	C. E. K. McCord and Co., Eidsvold
Corn Dag	2695	5	Chestnut	C. F. Milliken, Idermeer, Dilly Siding, Mail Bag, Rockhampton
Courtcraft	2696	6	Brown	S. R. MacDonald, Highland Plains, Clermont
Demon	2697	6	Bay	D. D. Logan, Warrinilla, Rolleston
Deveiled	2658	5	Bay	Gunnawarra Pastoral Co., Mt. Garnet
Diobaix	2659	5	Chestnut	L. D. Lucey, Mt. Garnet
Dromos	2698	Aged	Bay	Peak Downs Pastoral Co., Capella
Duke	2699	6	Brown	W. J. Dahtler, Nagoorin
Echo	2700	6	Bay	W. J. and W. D. Murphy, Birimgan, Blair Athol
Ellington	2701	Aged	Bay	E. D. Wells, Early Storms, Rolleston
Elogist	2660	5	Bay	H. W. Kirkwood, Ingham
Field O'Mine	2576	Aged	Brown	D. A. Proctor, Byrnestown
First Edition	2545	Aged	Bay	O. G. Ridge, Argyll Stud, Toowoomba
First Glen	2661	Aged	Bay	D. J. and P. McGrath, Mareeba
Fly Field	2702	Aged	Chestnut	E. H. Faint, Pioneer, Clermont
Foreign Scholar	2662	Aged	Bay	Queensland Stations Pty., Ltd. Wandovale, Charters Towers
Forty First	2703	Aged	Bay	J. Sullivan, Turkey Creek, Springsure
Fox Tar	2704	Aged	Black	Friend and Co., Springwood, Springsure
Glarrydon	2632	5	Chestnut	W. H. Reynolds, Winchester street, Hamilton
Gold Cob	2705	5	Chestnut	J. H. Wells, Rolleston
Gold Dust	2520	5	Bay	A. H. Kunde, Hazeldean, Kilcoy
Golden Grain	2707	6	Bay	N. G. Walker, Stanmere, Bororen
Gold Fish	2546	6	Brown	A. M. McAlpine, Eureka, Cambooya
Gold Hunter	2547	5	Brown	B. H. Brown, Wandoan
Gold Ore	2706	5	Brown	Thos. Borthwick and Sons, Banchory, Clermont
Graffmore	2708	6	Brown	Donkin Bros., Meteor Downs, Springsure
Great Felt	2633	5	Brown	T. J. O'Brien, Crossdale, *via* Esk.
Gun Craft	2709	Aged	Bay	M. Ryan, Arcturus, Springsure
Hebray	2634	5	Bay	A. Payne, Eidsvold
Hendra Lad	2635	5	Bay	W. Hennessey, Harding street, Hendra
High Monash	2617	6	Bay	W. A. Hart, P.O., Surfer's Paradise
Home Fire	2663	5	Bay	A. Wienholt, Carse-o-Gowrie, Ravenswood
Hybol	2502	6	Bay	J. A. A. McColl, Marshall street, Goondiwindi
Ike McCarthy	2710	5	Bay	Mrs. M. J. Faint, Karmoo, Clermont
Iliad (Imp.)	2548	Aged	Chestnut	W. Glasson, care of Queensland Club, Brisbane
Jazz Light	2711	Aged	Brown	E. A. Templeton, Huntley, Clermont
Jerval	2503	Aged	Bay	W. H. Anderson, Warwick
Jester	2578	Aged	Grey	Barton and Elliott Pastoral Co., Moolboolaman
Kialla King	2664	5	Brown	W. C. Storer, Upper Barron
Kingfisher	2712	6	Brown	A. Jackson, Yarraman Vale, Springsure
Kingfisher	2713	Aged	Bay	Donkin Bros., Meteor Downs, Springsure
King Rufus	2550	5	Bay	F. J. Turner, Irvingdale, Chinchilla
Kingsmond	2714	Aged	Chestnut	J. W. King and Co., Bulliwallah. Clermont
King's Own	2598	6	Bay	J. B. Shannon, Tooloombah, *via* Rockhampton
Lap Astre	2551	Aged	Chestnut	P. H. Wormwell, Bendee West, Meandarra
Last Eiffel	2504	Aged	Dappled grey	S. L. Moore, Merinda, Goondiwindi
Lavadon	2715	Aged	Bay or brown	Albro Pastoral Co., Albro, Clermont
Limoux	2636	Aged	Brown	M. Noonan, Tenterfield
Little Poitrel	2716	Aged	Chestnut	E. H. Faint, Pioneer, Clermont
Lord Tennyson	2505	6	Bay	J. S. Keen, Retreat, Goondiwindi

Blood Stallions Certificated for Life during Year 1940-41—*continued.*

Name.	No.	Age.	Colour.	Owner.
Mannar	2579	5	Chestnut	W. Titmarsh, Yerra
Medal Fair	2717	5	Chestnut	A. C. McLaughlin, Buckleton, Springsure
Medanui	2718	Aged	Chestnut roan	D. Williams, Florence Vale, Ruby Vale
Merry Moo	2719	5	Bay	A. E. Hopkins, Sapphire
Miles Falcon	2637	5	Brown	Mrs. D. A. Winten, Rosalie Plains
Millie's Hope	2638	6	Bay or brown	S. G. Morrow, Ascot street, Hendra
Monash Star	2639	5	Black	J. Gault, Edward street, Brisbane
Mt. Carmel	2506	Aged	Grey	Stokes and McCarthy, Mt. Carmel, Goondiwindi
Muddy Spot	2665	Aged	Grey	J. Rollinson, Allandale, Homestead
Musk	2521	5	Bay	J. R. Gloag, Joanda, Linville
Natural Silver	2522	Aged	Chestnut	P. M. Ryan, Viewland, Gatton
Nivetts	2666	6	Chestnut	Estate H. S. Williams, Yungaburra
No Name	2583	Aged	Brown	A. R. Atthow, Kandanga
Nonette Lad	2720	Aged	Chestnut	W. V. Finger, Hillview, Clermont
Nosegay	2580	5	Bay	Barton Elliott Pastoral Co., Moolboolaman
Oleora	2721	Aged	Bay	H. Carlisle and J. Corbett Taylor, Cullen-la-ringo, Emerald
Orphan Boy	2667	5	Brown	P. McDonagh, Mt. Molloy
Pasha Boy	2722	Aged	Fleabitten grey	Coreena Pastoral Co., Pasha, Clermont
Pashet	2723	Aged	Brown	E. T. Homer and Sons, Planet Downs, Rolleston
Pat. Clyde	2581	Aged	Bay	J. Staunton, Kammil, Emerald
Pen-Scribble	2724	Aged	Brown	F. Hebbel, Murgon
Pentator	2552	5	Bay	J. Banks, Wandoan
Phar Pal	2668	5	Brown	J. Rollinson, Allandale, Homestead
Power Chief	2523	5	Grey	J. C. E. Cork, Fordsdale, Grantham
Rallywin	2758	Aged	Bay	F. Trembath, Ingham
Red Duke	2725	6	Bay	Elgin Downs Pastoral Co., Clermont
Red Eagle	2641	5	Bay	G. F. W. Goodrich, Waroo, Inglewood
Roman Emblem	2582	5	Brown	E. C. Zillmann, Wallaville
Rosante	2642	6	Brown	Geo. H. Bignell, Widgegoora street, Cunnamulla
Rosette	2669	5	Dark-brown	V. H. Alford, Rangeview, Ravenswood
Royalburn	2643	5	Brown	J. F. Schmidt, Long Avenue, Hendra
Royal Mace	2524	5	Bay	Collins Bros., Mt. Surprise, *via* Cairns
Saracen	2599	5	Iron grey	W. H. Gillham, Suttor Creek, Nebo
Sarchedon	2726	Aged	Fleabitten grey	Logan Downs Pastoral Co., Clermont
Sarchette	2727	Aged	Fleabitten grey	W. Leahy, Ruby Vale
Sardyke	2728	5	Chestnut	Kavanagh Bros., Vandyke, Springsure
Scholar Cap	2729	5	Bay	Mackay and Co., Huntley, Clermont
Seducer	2553	5	Chestnut	Estate Dr. R. Macdonald, Coalbah, Meandarra
Serocold	2731	6	Chestnut	J. G. H. Wilson and Sons, Orion Downs, Springsure
Silver Charm	2732	6	Bay	F. J. C. Brown, Bombandy, Clermont
Sir Geraint	2733	Aged	Bay	McKenzie Bros., Coolarah, Alton Downs
Sir Nezd	2554	6	Iron grey	P. S. Cooper, Zilzie, Warra
Sir Ranian	2734	Aged	Bay	A. E. M. Baker, Malthoid, Capella
Smart Guy	2644	5	Chestnut	C. Davey, Rockhampton
Souvenir	2600	Aged	Brown	R. E. Muller, Proserpine
Starmint	2645	6	Brown	J. Y. Shannon, Rodney Downs, Ilfracombe
St. Aubin	2646	6	Chestnut	P. P. Venaglia, Rous street, Hendra
Sunbeam	2618	6	Bay	C. W. Schultz, Advancetown, Nerang
The Albatross	2647	5	Bay or brown	P. J. O'Shea, River road, Toowong
Tetraban	2648	5	Brown	R. P. Williams, Valera Vale, Charleville
Tommy	2735	6	Brown	N. G. Walker, Stanmere, Bororen
Tommy	2736	Aged	Brown	Bigge and McConnell, Consuelo, Rolleston
Top Up	2649	6	Chestnut	J. Griffiths, Gill street, Charters Towers
Vain Duke	2650	6	Bay	J. B. Shannon, Toolcombah, Rockhampton
Valight	2737	Aged	Chestnut	C. Pownall, Carfax, Clermont
Wearwell	2759	Aged	Bay	Natal Downs Pastoral Co., Charters Towers
Willwear	2651	6	Brown	I. Abrahams, Racecourse road, Ascot
Withjoy	2653	5	Chestnut	D. H. Robertson, Albinia Downs, Springsure
Wykeham	2738	Aged	Bay	H. C. and J. C. Taylor, Cullen-la-ringo, Emerald
Young Globe	2739	5	Chestnut	Mrs. A. B. McDonald, Degulla, *via* Clermont
Young Poy	2654	5	Brown	A. J. Fisher, Harding street, Hendra

Pony Stallions Certificated for Life during Year 1940-41.

Name.	No.	Age.	Colour.	Owner.
Bon Saada	2555	5	Cream	G. McCorry, Peranga
Cabulcha Cinnabar	2585	5	Chestnut	B. J. Morris, Teddington road, Tinana
Dickie Boy	2526	5	Black	B. J. Friske, Blenheim, Laidley
General Gordon	2655	6	Grey	C. P. Edwards, Abingdon Downs, Georgetown
Gold Cuffs	2508	5	Taffy	E. E. Belford, Wilga Park, Texas
Jack	2687	Aged	Bay	W. F. James, Bathampton, Clermont
Jeepers Creepers	2601	5	Brown	Mrs. R. S. Geddes, Glen Geddes
Jubilee	2527	5	Black	E. Clarke, Thornton, Laidley
Little Cobber	2609	Aged	Creamy	J. Rickuss, Broadwater road, Mt. Gravatt
Little Tartar	2610	6	Brown	C. Steinhardt, Hillview
Master Don	2556	5	Black	W. J. Smith, Murray street, Pittsworth
Model	2528	5	Bay	E. Hansen, Laidley
Playfair	2529	5	Brown	J. Harris, Tara
Redcliffe's Pride	2611	Aged	Chestnut	J. J. Grant, Redcliffe Parade, Redcliffe
Rocket	2612	5	Bay	A. S. Markwell, Box 26, Beaudesert
Sheik	2586	5	Grey	G. Palfrey Miva
Smokey	2602	Aged	Bay	H. Kaddatz, Homebush

PONY STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1940-41—*continued.*

Name.	No.	Age.	Colour.	Owner.
The Imp	2509	5	Dappled grey	A. J. Savage, Cooinoo, *via* Gore
Tim	2587	5	Grey	B. N. Trott, Mundubbera
Verne Sensation	2613	6	Brown	J. A. Rudd, Yeerongpilly
Warpaint	2530	5	Skewbald	H. Badrick, Oak Villa Stud, Forest Hill
Wee Macgregor	2557	5	Cream	H. G. Ruhle, Millwood, Milmerran
Young Ludo	2688	5	Creamy	J. M. Roy, Glenroy, Thangool

TROTTER STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1940-41.

Billy Wilkes II.	2614	6	Bay	M. Simpson, Cedar street, Cannon Hill
Black Jewel	2615	Aged	Black	E. C. Stevenson, Beechmont
Marble Jewel	2558	7	Black	W. F. Werth, Devon Park, Oakey
Master Nepean	2559	6	Bay	W. Sullivan, Pittsworth
Nan's Derby	2525	Aged	Bay	B. O. Stephan, Templin, Boonah
Sparkling Arrow	2560	5	Black	Theo Walker, Bell

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1940-41.

Abbey's Gift	2561	5	Bay	J. V. Willis, Meringandan
Admiral Gaiety	2531	5	Bay	C. Boyle and G. Winks, Harrisville
Alta Craig's Lustre's Dignity	2510	5	Brown	J. Hardy, Parkfield, Eukey
Balmedie Superb	2562	5	Roan	Mrs. R. V. Breydon, Brooklyn, Djuan
Black Boom	2588	5	Black	E. B. Pickels, Brigooda, *via* Proston
Blighty Bombardier	2596	Aged	Bay	A. Kubler, Boonah
Bold Dignity	2563	5	Bay	G. and H. Tews, Springside, Pittsworth
Bonny Charlie	2564	6	Brown	E. H. Barrett, Bruan Park, Tara
Bonny Tide	2670	6	Bay	Natal Downs Pastoral Co., Charters Towers
British Prince	2589	5	Bay	W. J. Brims, Blackmount
Browndale	2603	6	Bay	P. Matsen, Sarina
Bruce	2590	5	Bay	W. H. Roberts, Anderleigh
Bruce	2671	5	Bay	H. H. Steinhardt, Tarzali
Bundabaroo	2740	6	Bay	Hook and Co., Moray Downs, Clermont
Carlyle Dobbin	2565	5	Brown	A. J. Peake, Wandoan
Castlemaine	2566	6	Bay	L. Hogarth, Stonehenge, *via* Milmerran
Cereblue	2741	Aged	Dappled blue grey	A. R. Fletcher, Hebron, Springsure
Champion	2742	Aged	Bay	A. Jackson, Yarraman Vale, Springsure
Clyde	2743	Aged	Brown	E. and C. Goodwin, New Caledonia, Bluff
Comet	2744	6	Bay	J. G. H. Wilson and Sons, Orion Downs, Springsure
Craighill Holmar	2532	Aged	Bay	P. Truloff, Minden
Cristy	2672	5	Bay or brown	A. Black, Pajingo, Charters Towers
Don	2673	5	Bay	W. G. Soper, Home Hill
Donald Intent	2533	5	Brown	J. J. Coyne, Grandchester
Douglas Best	2745	Aged	Bay	J. H. Hofmeister, Norwood, Springsure
Dragon	2746	6	Bay	Donkin Bros., Metecr Downs, Springsure
Dunure's Delight	2674	5	Brown	B. A. Lynn, Ingham
Enchanter	2567	5	Bay	I. Evans, Jarail Creek, *via* Kingaroy
Fairholme Eclipse	2591	5	Bay	A. and J. Sippel, Murgon
Fairval Gaiety	2675	5	Bay	P. White, Tully
Fairval Noble	2592	5	Bay	Atherton Bros., Manar, Proston
Foxlow	2676	5	Dark grey	E. E. D. White, Toomba, Balfe's Creek
Foxlow Lord Trevor	2604	Aged	Grey	H. Rowe, Mirani
Fyvie Ideal	2625	Aged	Brown	W. Spray, Guyra
Gay Lad	2747	Aged	Bay	C.Q.M.E. Co., Avon Downs, Clermont
Glenmore II.	2568	6	Bay	G. Lucht, Kulpi
Grey Peter	2677	5	Roan	C. Brownson, Slogan Downs, Charters Towers
Heir's Like	2511	5	Bay	N. McMahon, Wheatvale
Irton Choice	2619	5	Bay	J. Drynan, Telemon Crossing
Kelso Surprise	2748	Aged	Bay	L. C. Walker, Box 136, Bundaberg
Kerrston's Joker	2534	5	Bay	H. M. Chaille, Esk
Kimberley	2678	6	Bay	F. R. B. Anning, Cargoon, Pentland
King Lustre	2537	5	Bay	A. Kanofski, Yarraman
King's Heir	2512	5	Bay	M. Long, Elsmere, Yelarbon
Kirkcaldy Flash Len	2569	5	Bay	H. Fischer, Mountain View, *via* Bowen
Knight Gown	2749	5	Dappled blue grey	R. K. Scantlebury, Theodore
Lion	2593	5	Bay	W. J. Patteson, Mundubbera
Lloyd George	2750	Aged	Brown	G. Matthews, Glen Franklin, Clermont
Lochiel	2679	5	Bay	S. W. Smith, Ravenshoe
Lord Nelson	2570	5	Brown	E. M. Schefe, Coalbank, Wutul
Major	2681	Aged	Bay	W. H. Jonnson, Millaa Millaa
Major	2680	5	Bay	A. G. Spotswood, Home Hill
Meditation (Imp.)	2571	6	Bay	L. H. Corser, Fairymeadow, Goombi Siding
Noble	2751	5	Bay	W. Leahy, Ruby Vale
Noble	2620	5	Bay	M. J. Mills, Gilston, Nerang
Pine Vale Knight	2757	Aged	Dappled grey	A. C. Williams, Homevale, Nebo
Prince	2621	5	Bay	E. G. Burnett, Rathdowney
Prince	2605	5	Bay	D. R. McGregor, Kungurri
Prince	2682	5	Chestnut	P. Svanosio, Kairi
Prince Intent	2513	5	Bay	J. F. Ryan, Borgers, Clifton
Prince Laddie	2683	Aged	Bay	P. White, Tully
Puzzle	2606	6	Bay	Mrs. J. Bracken, Goorganga Creek, Proserpine
Rare Gaiety	2535	5	Black	R. Harsant, Warrill View, Harrisville
Rex	2536	5	Bay	S. Walker, Woodford
Robin Hood	2594	Aged	Bay	G. J. Kennedy, Cloyne, *via* Goomeri
Robin Hood	2514	Aged	Bay	G. Stevenson, Craigie, *via* Tenterfield

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1940-41—*continued.*

Name.	No.	Age.	Colour.	Owner.
Rose Farm Kerrston's Pride	2595	5	Bay ..	F. Benson, Gundiah
Rose Farm Regal Lustre	2515	5	Bay ..	S. O. Mears, Cunningham
Royal Flush	2684	Aged	Bay ..	Natal Downs Pastoral Co., Charters Towers
Royal Prince	2516	5	Bay ..	S. Ryan, Massie
Royal Reserve ..	2538	5	Bay ..	Jas. Morrow, Peak Crossing
Royal Robin	2572	6	Bay ..	R. S. Storey, Kingsthorpe
Royalty	2752	Aged	Bay ..	T. Koina, Woorara, Springsure
Sir Dale	2539	5	Bay ..	Mrs. Ivy May Arndt, Rosewood
Skipper	2517	Aged	Grey ..	Geo. Palmer, Pratten street, Warwick
Squire Dale	2573	Aged	Bay ..	D. Gadsby, Jandowae
St. Helen's Major Dignity	2685	5	Bay ..	L. Storer, Atherton
St. Hilda's Nuggett ..	2622	5	Bay ..	W. Drynan, Glenapp
Surbiton	2753	Aged	Bay ..	M. J. Salmond, Brewery Springs, Clermont
Tamar Kerr	2607	5	Bay ..	N. Richards, Carrinyah, Nebo
Thorn Print	2518	5	Bay ..	Estate late Scott McLeod, Terrica, Inglewood
Top Boundary ..	2540	5	Bay ..	A. Wienholt, Kalbar
Valetta Horoscott ..	2608	5	Bay ..	A. H. W. Cunningham, Strathmuir, Collinsville
Vice Regal	2623	5	Bay ..	Miss A. Fleming, Kingston
Wheatley Lustre's Pride	2686	5	Brown, roan hairs	L. Favier and Sons, Kairi
Whiskers	2754	6	Bay ..	R. Benney, Blair Athol
Wolsingham Imperialist	2755	5	Bay ..	T. Clark, Bororen
Young Douglas ..	2624	5	Bay ..	J. Martin, Tambourine

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1940-41.

Adjutor	2019	4	Bay ..	T. J. Turkington, Pilton
Air Cadet	2028	4	Chestnut ..	C. A. Heaton, Glenmore Downs, Clermont
Beauforce	1978	4	Bay ..	E. N. Blomfield, Meenawarra, Cecil Plains
Blazer	1976	3	Brown	H. V. Littleton, Hillview, Crow's Nest
Calm Simon	1991	4	Bay ..	J. Kennedy, Kumbia
Canning Gold ..	1946	4	Chestnut ..	J. E. Carey, Monaro, Warwick
Child Chimes ..	2015	3	Chestnut ..	J. Sharrocks, Chelona, Mackay
Dandy	1977	4	Bay ..	H. G. Wood, Kupunn
Eureka Pride ..	1992	4	Bay ..	A. B. Peatey, Bundaberg
Feltial	1959	3	Bay ..	M. Laffey, Mt. Sylvia
Flametto	2038	Aged	Bay ..	J. M. MacDonald, Raglan (Provisional)
Harir's Image ..	2012	4	Bay ..	J. R. Perrett, Mt. Hope, Booie
High Spear	2029	3	Chestnut	E. H. Faint, Pioneer, Clermont
Incurius	2020	4	Brown ..	J. B. Shannon, Tooloomba, St. Lawrence
Leading Lad	2030	4	Bay ..	C. A. Barnard, Coomooboolaroo, Duaringa
My Toy	2018	4	Chestnut ..	G. Miller, Chamber's Flat, *via* Kingston
Rex Mont	2021	4	Brown ..	H. M. Warneminde, Royal Exchange Hotel, Albert street, Brisbane
Royal Spear	1960	3	Bay ..	A. Heit, O'Bum O'Bum, Roadvale
Sarab	2031	4	Iron grey ..	O. J. Salmond, Lestree Downs, Clermont
Sir Percy	1961	4	Bay ..	P. Parcell, Radford
Some Fire	1993	4	Brown ..	J. Pownall, Mundubbera
Swift Lad	2032	3	Bay ..	D. H. Robertson, Albinia Downs, Rolleston
Tieson	2033	4	Bay ..	Canal Creek Pastoral Co., Marrawing
Trafalgar	1994	4	Brown ..	H. S. Bloxsome and Co., Mundubbera

PONY STALLIONS CERTIFICATED FOR THE YEAR 1940-41.

Abdulla	2037	4	Bay ..	N. G. Walker, Stanmere, Bororen
Alladin Son	1996	4	Grey ..	L. C. Walker, Bingera Station, Bundaberg
Black Prince	1962	4	Black ..	J. C. Davey, Abbeystead, Gatton
Boonah Joy	1963	4	Taffy ..	W. Coyne, Grandchester
Bright Gay Lad ..	1964	4	Bay ..	F. Huth, Haigslea
Cabulcha Quicksilver..	2022	4	Bay ..	J. M. Newman, Caboolture
Don	1979	4	Bay ..	J. C. Naumann, Frogmore, Pittsworth
Gay Lad	1980	3	Brown ..	L. Henschell, Yarranlea, Pittsworth
Patch's Pride ..	1947	4	Skewbald ..	F. Hill, 34 Dragon street, Warwick
Playboy	1981	4	Piebald ..	Miss J. E. Taylor, Kulpi
Quicksilver	1982	3	Chestnut ..	L. R. Martin, Kumbarilla
Rocket	1948	4	Grey ..	H. Wagland, Wonga, Goomburra
Sonny Boy	2027	4	Chestnut ..	F. Williams, Box 166, Ingham
Storm	1965	4	Piebald ..	A. D. Watherston, Cliffdale, Withcott
Walker's Pride ..	1966	4	Brown ..	Mrs. E. C. Hayes, Harrisville
Young Cygnet ..	1949	4	Bay ..	P. H. Elks, Reeve's Ferry, Stanthorpe

TROTTER STALLIONS CERTIFICATED FOR THE YEAR 1940-41.

Edward Harem ..	2017	4	Black ..	G. O. G. Kriedemann, Upper Coomera
Joker's Pride ..	1995	4	Bay ..	W. H. Meyers, Box 98, Maryborough

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1940-41.

Banker	1997	4	Bay ..	W. Taylor, Barambah Creek, Gayndah
Canaga's Duke ..	1983	3	Bay ..	M. H. Pickthorpe, Canaga, Chinchilla
Captain	2034	4	Bay ..	C. R. Ambrose, Marmor
Captain Starlight ..	1967	4	Bay ..	C. Brown, Linville (Provisional)
Caringal Craighurst ..	1950	3	Black ..	W. Evans, Greenmount

Draught Stallions Certificated for the Year 1940-41—*continued.*

Name.	No.	Age.	Colour.	Owner.
Caringal Kerr Gay	1958	3	Black	W. Evans, Greenmount
Chief	1984	4	Bay	L. S. Gordon, Broxburn, Pittsworth
Crystalene	1951	3	Bay	T. M. Brown, Willowvale
Crystal Hope	1952	3	Bay	N. D. Nicholls, Pratten
Crystal Intent	1953	3	Black	V. C. Cutmore, Swanfels
Crystal Prince	1954	3	Black	N. D. Nicholls, Pratten
Dignity's Lad	1985	4	Brown	J. H. L. Von Pein and Sons, Quibet, Pittsworth
Everton Duke	1986	4	Bay	A. Tuppack, Jimbour
Fairymead Loyal Knight	1998	3	Bay	Fairymead Sugar Co., Bundaberg
General Chancellor	1999	4	Brown	J. A. Heading, Murgon
Glengoon Chancellor	2000	3	Bay	F. E. Mitchell, Byee
Glengoon Hiawatha	2001	5	Brown	F. E. Mitchell, Byee (Provisional)
Ideal Tim	2002	5	Bay	W. E. Sauer, Gayndah (Provisional)
Irton Pride	2003	4	Bay	E. J. Keys, Proston
Joker	1987	3	Brown	J. H. Brown, Wutul
King Donald	1955	4	Brown	N. A. Pollock, Araluen, Goondiwindi
Kirkcaldy Journalist	2004	4	Roan	R. Ewart, Nanango
Kirkcaldy Preference	1968	4	Bay	W. Profke, Glamorgan Vale
Lustre's Perfection	1969	4	Brown	Mrs. A. R. Elliott, Laidley South
Mailboy Royal Prince	2005	4	Bay	Mrs. W. J. Lye, Monto
Majuba Lord Nelson	2023	4	Bay or brown	P. J. Daley, Millaa Millaa
Majuba Rex	1988	3	Black	S. O. Mear, Carrington road, Toowoomba
Mountain Chief	2035	4	Bay	A. Marlow, Thangool
Pine Vale Darnley	2016	4	Bay	State Prison Farm, Palen Creek
Pride	1956	4	Bay	C. H. Kedwell, care of S. Sweedman, Post Office, Texas
Prince	2013	4	Bay	H. B. Lott, Kensington, Bowen
Punch	2014	3	Bay	A. W. Skewes, Maroomba, Marlborough
Rhodesia Chieftain	2006	3	Bay	Roy H. Lochran, Cloyna, *via* Murgon,
Rose Farm Lord Lustre	1970	3	Bay	R. Drew, Rose Farm, Forest Hill
Royal Add	1989	4	Bay	W. T. Gillies, East Cooyar
Royal Dignity	2007	4	Bay	E. Reinbott, Kingaroy
Royal Duke	2008	5	Bay	A. H. Lowe, Kandanga (Provisional)
Royal Lustre	1971	4	Bay	H. A. Stuhmcke, Glenore Grove
Royal Tenor	1990	3	Brown	S. Otto, Bum Bum Creek, Crow's Nest
Sudbourne Esquire	2024	4	Chestnut	P. Kidd, Malanda
Surradene Marquis	1972	3	Brown	J. Lehmann, Coolana, Rosewood
Talgai	2036	4	Bay	Chalk and Son, Dooruna Downs, Clermont
Talgai Streamline	2025	4	Bay or brown	J. Tate, Tolga (Provisional)
Tent Hill Fashion Lad	1973	3	Bay	W. H. Grams, Upper Tent Hill, Gatton
Terang Duke	1937	4	Bay	C. Head, Swanfels
The Iron Duke	2009	4	Bay	C. A. Kington, Monto
Toomba	2026	4	Bay	S. J. Haughtey, Ingham
Trementheere Royal	2010	5	Bay	A. H. Tanzer, Abercorn (Provisional)
Vamphire Heir	1974	4	Bay	F. H. Hahn, Coulson
Willowbank Skipper	1975	3	Black	T. D. Gnech, Mt. French road, Boonah
Wyoming Final Tide	2011	4	Brown	Fairymead Sugar Co., Bundaberg

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AN OLD HINGE AS A GATE LATCH.

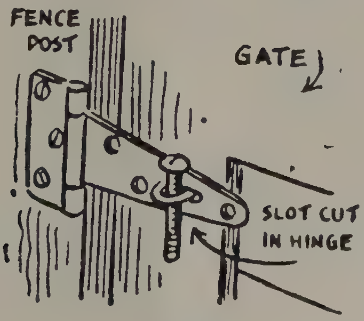

Plate 160.

Old hinges make good gate latches when used in the way shown here. After being slotted with a cold chisel the hinge is mounted on either the gate or the post and a good heavy staple provided to hold the latch bolt. Fasten the bolt to the gate or the post with a bit of string, and all risk of dropping it is avoided.

REJECTED STALLIONS.

List of Stallions in respect of which Certificates of Registration were refused on account of lack of type and/or conformation, lack of size or unsoundness, during the year 1940-41. These horses are prohibited from service, either public or private:—

BLOOD STALLIONS REJECTED DURING THE YEAR 1940-41.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Barfield	Aged	Brown	Spavin	E. T. Homer and Sons, Barfield, Banana
Baytie	5	Bay	Ringbone	P. Knudsen, Theodore
Gloveman	6	Bay	L.C.	T. W. Lewis, Moolboolaman
Golden Summit	5	Chestnut	L.T. and C.	A. W. N. Stone, Emerald
Kerman's Pride	3	Bay	L.C.	H. Kerle, Booral, *via* Nikenbah
Land Night	6	Chestnut	L.T. and C.	C. Jansen, Clermont
Modesto	Aged	Bay	L.T. and C.	T. Mullins, Wheatvale
Pavokoff	5	Bay	Spavin	W. H. Bell, Strathdee, Nebo
Regular	6	Bay	Unicrypt	Mrs. C. E. Goodenough, Bulliwallah, Clermont
Rex	4	Bay	L.T. and C.	G. M. Pedersen, Wiseby, Rolleston
Rivory	4	Bay	Spavin	H. A. Burgess, Miriam Vale
Royal Ship	6	Bay	L.T. and C.	C. B. Atthow, Imbil
Royal Thorn	5	Bay	L.C.	G. Stehbens, Kingaroy
U.I.	5	Bay	L.T. and C.	W. O'Sing, Builyan, *via* Gladstone
War Paint	Aged	Bay	Unicrypt	P. Carsberg, Allora
Warwick	5	Bay	Crypt	E. E. D. White, Toowoomba
Wee Lu	6	Bay	L.C.	T. O'Doherty, Goombungee
Yendor	5	Brown	L.T. and C.	E. Y. Shannon, Tierawoomba, Nebo
Unnamed	3	Brown	L.T. and C.	P. M. Smith, Kerry, Beaudesert

PONY STALLIONS REJECTED DURING THE YEAR 1940-41.

Airzone	6	Skewbald	L.T.	R. W. Guppy, Eastwood, Tara
Black Pepper	5	Black	L.T. and C.	W. C. H. Pohlmann, Pallas street, Maryborough
Gay Lad	4	Grey	L.T. and C.	C. S. Gordon, Tiaro
Khedive	5	Grey	L.C.	R. B. Jefferies, Murgon
Warwick Boy	Aged	Brown	L.T. and C.	J. Mullins, Mill Hill

TROTTER STALLION REJECTED DURING THE YEAR 1940-41.

Ronnie Wilkes	Aged	Brown	Unicrypt	G. Nutley, Raceview, *via* Ipswich

DRAUGHT STALLIONS REJECTED DURING THE YEAR 1940-41.

Afton	Aged	Bay	L.T. and C.	H. Siemon Pty. Ltd., Charters Towers
Argyle Revenue	Aged	Bay	S.B. and R.B.	A. Smoothy, Mirani
Bald Ker	5	Brown	S.B.	H. D. Reisenleiter, Mt. Sylvia
Ben Lomond	6	Bay	L.C.	C. B. Atthow, Imbil
Bill	Aged	Bay	L.T. and C.	J. F. Pengelly, Ruby Vale
Black Prince	Aged	Brown	L.T. and C.	G. Ellrott and Sons, Sliepner Junction
Boomer	4	Bay	L.C.	F. Brazier, Jua, *via* Tingoora
Douglas Credit	5	Brown	S.B.	W. G. Frey, Inglewood
Duke	4	Bay	L.C. and Size	C. W. King, Imbil
Duke	6	Bay roan	Cataract	G. C. Seirup, Gracemere
Gaiety	4	Bay	L.T. and Size	R. A. Shelton, Monto
Glen Wallace	5	Bay	S.B.	S. B. Trigger, Biggenden
Grey Ker	4	Grey	S.B.	H. D. Reisenleiter, Mt. Sylvia
Jimmy	Aged	Grey	L.T. and C. and S.B.	G. A. Kelly, Biboohra
Jondaryan Cheers	5	Brown	S.B.	Logan Downs Co., Clermont
Kerwonga	4	Bay	L.C.	E. Geitz, Middle Park, Allora
King	Aged	Bay	L.T. and C.	T. Mullins, Wheatvale
King	4	Bay	L.C.	W. R. Nichol, Biggenden
Larundel Magic	Aged	Bay roan	S.B.	W. J. Edwards, Mirani West
Lightfield Chief	5	Bay	L.T.	J. A. Reibel, Sexton
Lion	5	Grey	L.T. and C.	A. E. M. Baker, Malthoid, Capella
Major Wiley	Aged	Bay	S.B.	E. H. Faint, Pioneer, Clermont
Noble	6	Chestnut	L.T. and C.	W. J. Croydon, Orange Grove, Clermont
Pretty Robin	4	Bay	S.B.	R. Hamilton, Southbrook
Prince Charlie	Aged	Chestnut	L.T. and C.	H. G. Walters, Proserpine
Prince Fashion	Aged	Bay	L.T. and C.	J. Mullins, Mill Hill
Prospect	5	Bay	S.B.	R. E. Gillespie, Junabee
Ranger	5	Bay	L.T. and C.	H. C. Taske, South Kalkie, Bundaberg
Royal Prince	4	Brown	L.C.	W. H. Litzow, Hunter street, Brassall
Scotland Yet	5	Bay	L.T. and C.	A. Smith, Koonandah, Bowen
Sonny Baronet	Aged	Bay	Stringhalt	C. K. Shannon, Theresa Downs, Capella
Star Lad	5	Brown	S.B.	J. C. Sam, Narrien, Clermont
Tony	Aged	Grey	S.B.	G. W. James, Bathampton, Clermont
Volunteer	3	Bay	L.T. and C.	Queensland Stations Pty. Ltd., Wandovale, Charters Towers
Wadeleigh, General Intent	6	Bay	L.C.	R. W. Innes, Wadeleigh, Boompa

Plate 161.

An Access Road to Newly-Settled Country, Innisfail District, North Queensland.

[*Photo.: Lands Department.*

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of October, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Sunnyside Gentle 20th (365 days)	Paul Moore, Sunnyside, Wooroolin	15,472·45	660·075	Bruce of Avonel
Sunnyside Honey 8th	Paul Moore, Sunnyside, Wooroolin	13,235·65	479·299	Bruce of Avonel
Pet of Pinelands	R. Ashford, Pinelands, Springside	10,806·08	407·758	Governor of Durham Park
Braemar Patsy	R. Ashford, Pinelands, Springside	10,605·36	373·506	Braemar Keeper
	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Springlands Myrtle	V. A. Wyvill, Yarralea, Upper Yarraman	8,164	334·503	Gordon of Swanlea
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Navillus Princess 4th	C. O'Sullivan, Navillus, Ascot	9,911·8	390·865	Parkview Mars
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Valera Milkmaid 2nd	R. Ashford, Pinelands, Springside	9,413·07	358·241	Kilbirnie Royalist
Navillus Vision 3rd	Con. O'Sullivan, Navillus, Ascot	9,029·75	345·665	Parkview Mars
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Oakvale Young Rapture	Con. O'Sullivan, Navillus, Ascot	7,723·1	289·605	Chatham of Raleigh
Ethel XIth of Blacklands	A. Pickels, Proston	6,848·6	252·695	Limelight of Parkview
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Carn Brae Cherry	A. T. Paull, Bowenville	6,135·31	295·288	Laguna Emblem
Murray's Bridge Dina	A. T. Paull, Bowenville	6,721·56	264·594	Murray's Bridge De Valera
Ardilea Gwen 2nd	W. Hinrichsen, Ardilea, Clifton	6,437·25	260·129	Midget Sheik of Westbrook
Navillus Vera 8th	Con. O'Sullivan, Navillus, Ascot	6,015·75	248·885	Alfa Vale Prince Henry
	JERSEY.			
	MATURE COW (STANDARD, 350 LB.).			
Glenmoore Gentle Jean (365 days)	J. H. Caldwell, Walker's Creek, Bell	13,925·54	786·327	Glengarry Lord Dictine

	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Narcissus of Windyway	Wakefield Bros., Upper Barron, Atherton	6,153·2	367·872	Royal Emblem 2nd of Rosedale
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Trinity Bright Girl	G. Champney, Wooroolin	9,224·4	490·026	Trinity Nobly Born
Oxford Rillaa	J. Sigley, Millaa Millaa	6,222·55	335·079	Oxford Peer
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Elladale Bravo's Marie	G. Champney, Wooroolin	8,084·4	404·847	Rosecliff Flowers Bravo
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Keystone Goldenia 2nd	E. J. Keys, Keystone Stud, Proston	7,625·5	414·651	Gunawah Gamboge Prince
Oxford Snow Flake 2nd	Farm Home for Boys, Westbrook	6,367·8	308·9	Oxford Peer
Westbrook Bells 4th	Farm Home for Boys, Westbrook	6,213·95	299·524	Oxford Gem's Ambassador
Glenview Delight	F. P. Fowler and Son, Glenview, Coalstoun Lakes	6,097·95	283·314	Trinity Governor's Hope
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Lermont Peg	J. Schull, Lermont, Oakey	5,835·55	304·783	Woodside Golden Volunteer
Trecarne Graceful 3rd	P. H. Schull, Woodview, Oakey	4,552·3	264·684	Trinity Some Officer
Strathdean Princess (242 days)	S. H. Caldwell, Walker's Creek, Bell	4,909·68	237·248	Landside Noble Dreamer

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General Notes

Staff Changes and Appointments.

Mr. T. A. Smith (Toowoomba) has been appointed an honorary fauna protector.

Sergeant G. Schmidt (Morven), Sergeant J. W. Elstob (Pomona), Sergeant D. Spada (Monto), Sergeant A. A. Zeller (Howard), and Constable F. J. McNeven (Leyburn) have been appointed also inspectors under *The Slaughtering Act*.

Mr. A. G. Dougall, of Wadeleigh, Miriam Vale, has been appointed an honorary fauna protector.

Constable J. Moran (Glenmorgan) has been appointed also an inspector under *The Slaughtering Act*.

Wild Life Sanctuary at Miriam Vale.

Wadeleigh, the property of A. G. Dougall, Miriam Vale, has been declared a sanctuary under and for the purposes of *The Fauna Protection Act of* 1937.

Fruit and Vegetable Levy.

The Executive Council has approved of an extension for a further twelve months of the Stanthorpe Fruit and Vegetables General Levy Regulation which has been in operation for a number of years.

This regulation empowers the Committee of Direction of Fruit Marketing to levy on growers of fruit and vegetables in the Stanthorpe area, the sums raised thereby being used—firstly, in payment of expenses of collection of the levy; and, secondly, for administrative purposes of the Deciduous Sectional Group Committee. The levy is at the rate of 3s. 4d. per ton of fruit and/or vegetables consigned or despatched in the process of marketing; or a proportionate part of this amount for any portion of a ton.

Grading and Packing of Dried Fruits.

The Dried Fruit Grading and Packing Regulations of 1940 have been issued under *The Fruit and Vegetables Acts*, 1927 *to* 1939.

These regulations provide that no person shall pack or sell any dried fruit unless such dried fruit is graded in accordance with the standards prescribed, and unless the case or package containing such fruit is clearly and legibly stencilled or labelled on the outside with the name and address or brand of the packer and the name of the dried fruit and its appropriate grade description.

The dried fruit in any one package must be of uniform grade; it must be prepared from sound, naturally ripened fruit and possess the flavour characteristic of its respective kind, and must be thoroughly cured and free from disease.

Wild Life Preservation—A Boyne Valley Sanctuary.

Glengarry, the property of Messrs. Dickinson Bros., Boynedale, Boyne Valley Line, has been declared a sanctuary under *The Fauna Protection Act of* 1937.

Sale of Poultry.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock) announced recently that under *The Diseases in Poultry Acts*, which were amended during the last session, provision was made for a system of delivery notes in connection with the sale of poultry, and the Act has now received Royal Assent.

The Act provides that no person shall sell for human consumption any poultry or the carcass of any poultry obtained from any other person unless he has received a delivery note for such poultry. All delivery notes must be in writing, and signed by the person making the sale, containing his name and address and the number and species of poultry delivered. If the person from whom the poultry were obtained was not the owner of such poultry, then, in addition to his name and address, the name and address of such owner and, in the case of delivery on sale, the purchase price.

Inspectors of poultry are empowered to enter the premises where poultry are being sold for human consumption and inspect poultry or carcasses of poultry offered for sale and delivery notes. These delivery notes must be retained for a period of three months.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

A North Queensland Cycad.

E.G.G. (Mount Molloy)—

The specimen forwarded is *Bowenia spectabilis*, a cycad, and a native of North Queensland. The genus is represented by two species, the one you sent, which is fairly widely spread in North Queensland, and another, *Bowenia serrulata*, which is confined to the Byfield district in Central Queensland, and is sold as an ornamental plant under the name of "Byfield Fern." This plant belongs to the Zamia family, and in North Queensland is commonly called Zamia Fern. The male and female plants are distinct. Your specimen is very acceptable for our collection, and represents a nearly ripe female cone. The plant also produces a large underground tuber.

Bindweed—A Serious Pest.

H.S. (Blenheim, via Laidley)—

The specimen is the Bindweed (*Convolvulus arvensis*). This weed made its appearance on the Darling Downs some years ago, and is now much on the increase. It is a very serious pest, particularly in the Southern States. They have had more experience with it than Queensland, and a booklet issued by the Department of Agriculture, New South Wales, makes the following recommendation:—"Where the land is suitable for lucerne, the weed can be controlled by laying the land down to this crop for a period of years. The continual mowing of lucerne eventually kills out the Bindweed. If it is not desirable to sow the land with lucerne, it is recommended that land be deeply ploughed about September and frequently cultivated deeply with a tined cultivator in order to dry the land as much as possible, and to bring the roots to the surface. If dry weather is experienced, much of the weed will be destroyed in this way. Spraying with sodium chlorate, 1 lb. to 1 gallon water, applied at the rate of 300 gallons per acre, is recommended for destruction on a small scale." If you have only a small patch of the weed spraying with weak arsenical solution is satisfactory, but this has to be done several times before the weed is finally destroyed.

Trees for the Central-West.

K.G.S. (Dartmouth)—

Trees suitable for your district are:—Bottle Tree—both the narrow-leaved variety (*Sterculia rupestris*) and broad-leaved variety (*Sterculia trichosiphon*). The latter is the commoner one in the Central West and North, but the former makes far the better "bottle." If you have difficulty in obtaining it from nurserymen, we think the Curator of the Botanic Gardens, Rockhampton, has a stock of the broad-leaved variety, and the Curator of the Brisbane Botanic Gardens a stock of the narrow-leaved variety. The latter charges 2s. per plant for seedling trees distributed. Trees are issued by the Brisbane Gardens mainly to schools and public bodies, but plants unobtainable through the ordinary commercial channels could be supplied. Portugese Elm (*Celtis sinensis*), obtainable from Botanic Gardens, Brisbane; Citron Gum, obtainable from most nurserymen and from Botanic Gardens, Rockhampton; *Schotia brachypetala*, a tree with bright red flowers, should do well with you. The Botanic Gardens, Rockhampton, could supply Queensland Nut (*Macadamia ternifolia*).

If you wish to grow palms the common Date Palm (*Phoenix dactylifera*), the Canary Palm (*Phoenix canariensis*), the Cotton Palm (*Washingtonia*), and Wine Palm (*Cocos Yatay*) are all hardy growers in the West.

You are advised to get in touch with Mr. H. G. Simmons, Curator of the Botanic Gardens, Rockhampton. He could tell you what he has on hand in his nursery collections, and those suitable for planting in your district.

Rural Topics

Farmers to be "Mentioned in Despatches."

''By their works ye shall know them!'' is surely a fitting motto for the system which has been set up in Nova Scotia in Canada by the Department of Agriculture there which provides special recognition each year of men, farmers and others, who have not only given outstanding service to agriculture and to their respective communities, but who also by their faithful efforts and adherence to sound farming practices have made a success on the soil and have set an example to others. In other words, if such worthy citizens do not get a decoration they will, at least, be mentioned in dispatches.

Water Meters for Dairy Cows.

Some years ago meters were placed on the individual drinking troughs of ten cows at Michigan State Agricultural College, U.S.A. The heaviest drinker consumed a gallon of water for every 2¾ lb. of milk produced, drinking an average of a little more than 20¼ gallons of water a day. Dr. Morrison, the author of ''Feeds and Feeding'' tells us that on a ration of silage, hay, and concentrates cows will drink in ordinary weather from about 2½ to 4½ lb. of water for every 1 lb. of milk they produce, in addition to the water in their feed. These figures furnish a definite reminder of the importance of plenty of water in milk production. Best results are obtained, of course, when the milkers have water of moderate temperature handy to them all the time.

Rubber Lugs for Steel Tractor Wheels.

Solid rubber lugs designed to take the place of steel angle cleats or spade lugs on tractors, thrashing machines and combines is a new American idea. ''Barcleats'' is the name given to them, and they can be used on any steel wheel with a face width of from 4 to 24 inches, being quickly and easily bolted on. Their use, it is claimed, serves to modernise steel tractor wheels with rubber; thus, any tractor may be converted to an up-to-date machine for the low price of the lugs.

Creosote for Soft Woods.

The life of any timber underground can be extended with the use of creosote, and on many farms in New Zealand pine and other soft woods are being used for fencing and so are being treated with creosote. At Rotorua, the State Forest Department has a creosoting plant in which straight unsplit saplings of pine are being treated as fence posts, and it is expected that this treatment will give them a life underground of up to thirty years.

Hurdles.

Here is a bit of interesting philosophy from a thoughtful farmer. The talk was about the things that prevent the primary producer from getting too rich—the hurdles we all have to get over some time or other in our lifetime: ''We ought to be thankful,'' said our philosophical friend, ''for the fact that there are hurdles in life, instead of moaning about it. We really ought to be glad that they are higher than most of us like to jump. We ought to be grateful, too, that there are so many of them. It is those hurdles that give you your chance to work your way to the front. Without hurdles, we'd all be in a flat race in which cunning rather than character would count most—at least for a time. The hurdles of life are set out for a purpose. They are part of the grand scheme of things. Take them as they come, with a prayer for the nerve-power, the heart-power, and the leg-power to get over each of them as you come to it.''

The Best Test of Milk Yield.

Practical men have rightly come to the conclusion that the only infallible tests of the milking qualities of a cow are the milk scales and the Babcock tester, and that the quality and capacity of the udder itself are the most important indications of milking qualities. Authorities tell us that we should beware of the fleshy udder, because if we judge by outward appearance it looks good to the eye but never fails to disappoint. The perfect udder has a fine elastic skin, and, when empty, hangs in loose folds; but the fleshy udder looks almost as full after milking as before. It is a remarkable fact that the udder with a fine elastic skin and loose folds after milking is, as a rule, the easier of the two to milk, a good flow being obtained with comparatively little effort on the milker's part.

A Lamb-Tailing Experiment.

Here is the story of an interesting experiment in tailing lambs: On a well-known station property at lamb-marking time last year some ewe lambs had their tails docked very short; in another large group the tails were left about 2 inches long; and in another similar group the tails were left 4 inches long. Each group was kept under close observation, and it was found that the longest tailed group was much freer from fly strike than the other two groups. The percentage of fly strike in the long-tailed group (that is, the lambs left with 4-inch tails) was less than half that of the very short-tailed group, and appreciably less than the percentage of strikes in the medium length (2 inches) tailed group. In other words, tails left 4 inches long proved best in practice. All the lambs were run together, and a record of all fly strikes was kept.

Research for the Citrus Grower.

Growers of citrus fruits will be interested in this news item from California:—

"The future of the citrus industry will depend largely on dietetic research. There is a growing acceptance by the medical profession of the importance of citrus juices in the prevention and cure of disease. Naturally, such knowledge proceeds slowly, but it is gaining momentum. Much more must be done.

"During the world war it was noted that soldiers who convalesced in the south of France where they were given citrus fruits and vegetables were discharged from hospitals quicker than those in other parts of France. Experiments at the University of California suggests the same thing—that vitamin C is an important influence in the rapid healing of wounds.

"There is considerable significance in this under war-time conditions, but there is a much greater potential in the peace-time problems of healing the sick and wounded."

Rubber Tyres Save Time.

Confirmation of the advantages of pneumatic tyres on tractors, which have also become so noticeable to tractor users in Queensland, is provided by an investigation in the State of Iowa (U.S.A.). In the first place, there was found to be an average saving of 22 per cent. and a time saving of 23 per cent.

Out of 200 farms on which investigations were conducted, only three showed unsatisfactory results. The hours of use of tractors amounted to an average of 984 each year, and the useful tyre life ranged from three to fifteen years, with an average of seven years.

To get the best out of rubber tyres, users are advised to adopt the highest practicable speed, the widest implement that can be pulled satisfactorily at that speed, and adequate wheel weight.

The Economy of Flesh and Blood Horsepower.

The economy of the use of either the horse or the tractor on the farm continues as an evergreen "top rail" argument. All sorts of factors come into the discussion. Among other things, horse costs depend on the individual and his fondness for and management of horses, the nature and extent of the work that has to be done, efficiency of the equipment used, and what the farm can produce in the way of horse feed.

Tractor costs are not so tangible, but here again the individual comes into the argument. Much will depend on the user of the tractor and whether he is mechanically minded, and whether he is able to get all the power he can out of the machine without breaking things. The size of the farm, the nature of the farming, and general managerial efficiency also affect tractor costs.

On some farms it has to be granted that the tractor as we know it to-day has a definite place that cannot be challenged; on other farms it is a doubtful proposition, and on on many it should have no place at all. The principal factor in the economical use of the tractor is the size of the farm, especially where wheat is the chief crop cultivated.

When the Cow Looks for a Lick.

If a lick is needed at any time of the season it is at the stage when the dairy herd is dried off and the cows are preparing for their next season of production. The production of a calf takes a heavy toll from the mineral reserves in a cow's system, and if she is to be kept healthy and have a well-developed calf, a suitable lick should be provided so that she may replenish those mineral reserves.

Farm Notes

JANUARY.

THE heaviest rains of the year occur usually during the January-March period, and, weather conditions permitting, the main field activity for the month will be the preparation of land for autumn and winter crops, together with the scarifying and chipping required for existing row crops.

In all districts where wheat, barley, canary seed, and oats have been harvested, ploughing should be continued in order to conserve moisture for the succeeding crop, and to eradicate troublesome summer weeds.

Early ploughing ensures the accumulation of subsoil moisture, which is invaluable in promoting the growth of winter cereals at a time when seasonal rainfall is often deficient. The practice of early ploughing is recommended, especially to dairymen outside the wheat areas who normally sow oats, barley, and wheat for green feed.

Land intended for the February potato planting will now be in an advanced stage of preparation. The selection of whole seed from disease-free crops is recommended for autumn planting, as losses may occur from rotting if hot, wet conditions prevail after the planting of cut sets. Very small whole potatoes, less than 2 inches in diameter, are not likely to give the same results as more robust potatoes.

Succession sowings of summer fodder crops—such as sorghum (saccaline, white African, and imphee), Sudan grass, white panicum, Japanese millet, and cowpea may be continued where land is available. Maize sowing may also be completed in districts where early frosts are not the usual experience, but preference should be given to early-maturing or mid-season varieties.

Full advantage should be taken of the opportunity to arrange for the adequate conservation of fodder during the summer growing season, when the production of bulky, green crops presents no great difficulty.

Well-grown crops of maize and the sweet sorghums cut at the right stage of growth and before full maturity will make excellent silage which may be economically conserved in pit, trench, stack, or overhead silo. Surplus green grass, and many other green crops also, will make satisfactory silage for winter feed, and as a reserve for dry periods. Many dairy farmers prefer to rely on a continuity of green fodder crops throughout the year, but provision also should be made for conservation, for if pastures are scarce because of dry conditions, crop growth is then also at a minimum.

January is usually a favourable month for the sowing of paspalum, Rhodes, and other summer grasses in districts suitable for their growth. Recently burnt scrub land or thoroughly cultivated areas provide a good seed-bed, given sufficient moisture, but care should be taken to ensure that the germination standard of the seed is sufficiently high, as a good cover and rapid early growth is the principal factor in keeping weeds and undergrowth in check.

All harvesting machinery should be placed under cover. Repairs and adjustments may be regarded as wet-day jobs.

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FILMS FOR THE FARMER.

An example which might well be followed by interested organisations in Australia was set recently by the United States Department of Agriculture. A two-reel sound film, showing proper methods of trucking and railing live stock, was produced and distributed to various responsible bodies on application. Included in the precautions presented on the screen were the removal of nails or other projecting objects in trucks and yards, and the use of canvas slappers instead of whips and prod-poles for driving animals along a race.

The possibilities of such a form of visual education are immense.

Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ORCHARDS and plantations should now be carrying a good cover crop, which will help to check erosion during the wet season and, when cut and turned under, maintain the soil in good physical condition.

Pineapple plantations should be kept well worked.

Bananas and pineapples may still be planted, although it is somewhat late for the former in the southern parts of the State. It would be wise to keep a good lookout for pests of all kinds, including maori on citrus trees, scale insects, leaf-eating insects, borers, and fungus pests generally, using the remedies recommended by the Department of Agriculture and Stock.

Care is advised in handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they should be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured, mature fruit, with the bloom on and without blemish, always sells well. One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force, and immature grapes are liable to condemnation.

Bananas for the interstate trade should be well filled, but showing no sign of ripening. The fruit should be carefully graded and packed and the cases marked in accordance with the prescribed regulations and despatched without delay.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Stanthorpe district, and orchardists will be fully occupied gathering, packing, and marketing the crop of mid-season fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefully selected and properly graded and packed, they should carry as far as Cairns.

Points to remember—

Fruit should be fully developed, but quite firm when gathered.

It should be handled carefully. Bruised fruit is spoilt fruit.

Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.

Fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

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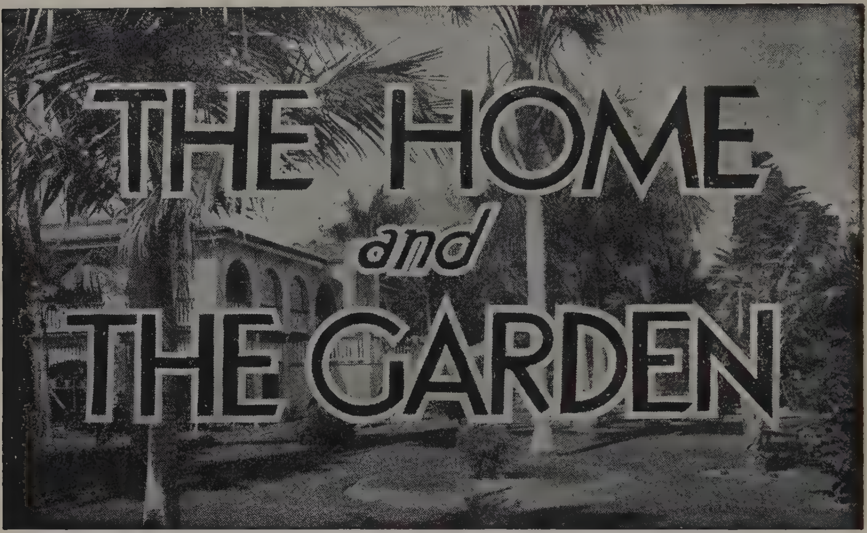
MEN OF WAR PRACTISE THE ARTS OF PEACE.

Diggers of the New Zealand forces now in Egypt have formed a young farmers' club, which has taken on well and provides, in the words of one Digger in a letter home, "a wonderful respite from the army and war talk." Over 100 members have been enrolled; most of them were members of farmers' clubs before they enlisted. So, notwithstanding the need for learning all about the arts of modern war, the Anzac Farmers' Club has been able to arrange visits to research stations and agricultural colleges in the Nile Valley and so make the best of an opportunity of observing agricultural practice in a country where farming has been a chief industry since the days before Moses was found in the bulrushes to lead, in later years, his people to the Promised Land where to-day Australian Diggers, like their New Zealand cobbers, are seeing the strange contrasts of ancient and modern methods of extracting wealth from God's Good Earth.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

CARE OF MOTHER AND CHILD.

CHILDREN AND THE HOLIDAYS.

PATRICIA, aged five years, whose home is in the country, is quite excited! She and her family have been invited to spend the Christmas holidays at the seaside. Patricia has never see the sea, but for a long time she has been interested in looking at pictures of children building castles and making gardens on the sand. Her mother has talked to her, too, about the happy days she used to spend at the seaside when she was a little girl. Patricia has a baby brother, Peter, who is five months' old. One day she asked her mother what they were going to do with Peter, for she did not think that he could travel so far from home.

Preparation for Travelling.

For mother, the preparation for the journey entails much thought, time, and work. The only opportunity she gets is when the children have been put to bed.

Baby and His Food.

Travelling should make little or no difference to the daily habits of baby in regard to sleeping and feeding. Peter is breast-fed, so there is no difficulty about his food. Their neighbour, who is to accompany them for part of the journey, is not so fortunate. Her baby, who is a few weeks younger than Peter, is bottle-fed on a cow's milk mixture. It will not be safe to feed him on cow's milk while he is travelling, particularly as the weather will probably be hot. Germs multiply most rapidly when milk is lukewarm. Ice boxes can be obtained from the Railway Department, but unless the milk can be brought to the station in a chilled condition and packed in ice immediately, it will not be safe to use it. It is not wise to rely on milk procured from refreshment-rooms for baby.

On any journey lasting more than three or four hours it will be safer to carry some form of dried milk or milk powder. In this case all that is required is a standardised measure to measure the powder, boiling water, and a cup or small jug in which the food can be mixed. It is advisable to give the food rather less than full strength, and at the end of the journey to return to baby's usual food. For very young babies who are being fed artificially it is often convenient to use a condensed milk mixture.

It is a good plan to have two or more feeding bottles and teats in case there is difficulty in washing the used ones. A biscuit tin in which to keep the bottles and teats is useful. These should be wrapped in old clean linen or butter muslin. Milk which baby leaves in the bottle should be thrown away immediately, and the bottle washed if possible; otherwise, this milk will become contaminated and dangerous. An ample supply of clean drinking water should be carried in order to quench baby's thirst.

Patricia's Food.

It will be inadvisable to rely on food purchased from restaurants or refreshment-rooms for Patricia. A tin of twice-baked wholemeal bread will be found useful. Sandwiches made of stale wholemeal bread, cut thin and buttered, should be prepared. Fillings may consist of grated cheese or hard-boiled egg with or without lettuce, extract of yeast, such as Marmite or Vegemite, &c., finely grated carrot or peanuts, peanut paste, minced currants, raisins (seeded), prunes, sliced tomato, banana, or pineapple, minced meat or poultry, fish, such as salmon. Some uncooked fruit, such as apple, orange, pear, peach, banana, and papaw should be carried. A tin or two of full cream dried milk will be useful. Orange or pineapple juice added to the water and slightly sweetened with home-made lemon syrup, will make a pleasant and wholesome drink.

Clothing and Wraps.

Railway carriages are apt to be draughty. If the windows are closed they become stuffy. The child's position should be arranged so that the wind will not blow directly on to him. He should not be allowed to become overheated by being overclad. A plentiful supply of napkins will be necessary. A mackintosh bag makes a good receptacle for these when they are wet. If this is not procurable, tight little parcels may be made by wrapping them in several thicknesses of newspaper. A bundle of old newspapers and pieces of old linen (damp or dry) will be found useful in more ways than one. A little enamel chamber should be provided. In addition to the light clothing suitable for the season of the year, a woollen jacket and shawl for Peter, and a light coat and rug for Patricia should be included for use in the evenings.

Dress Basket.

A dress basket is invaluable when travelling with a young baby. It provides not only a receptacle for his clothes, but also a comfortable bed. When baby has to be nursed for long both mother and child become overheated, overtired, restless, and irritable.

Sleep.

It is important that sleep should be ensured for all young children who are travelling if over-fatigue and fretfulness are to be avoided. For a child of Patricia's age a bed may be improvised on a seat or, if the train is crowded, a light board, which has a number of uses, may be placed between the seats and pushed against the side of the carriage. A cushion and a rug placed upon it make a comfortable bed.

Toys and Picture Books.

Most children of Patricia's age will divide the time between sleeping and watching the novel sights out of the window. A few simple toys and picture books may be provided with advantage.

Control.

If their children have been well managed, parents will be well repaid while travelling. Children who have been badly managed will be a source of endless worry, and before the end of the journey the whole family will be in a state of fatigue and upset—a bad beginning for a holiday.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred Street, Fortitude Valley, N. 1, Brisbane.

DRINKS FOR SUMMER DAYS.

Barley Water.

Wash barley very well, taking care to remove all the starch. It is a good idea to rub it well with the hands in the water in which it is washed. Allow 1 tablespoon barley to each quart boiling water and boil rapidly for twenty minutes, adding a few slices of lemon during the boiling. Allow to cool, add fruit juices and sugar to taste. Chill before serving.

Fruit Punch.

Make some China tea and measure 1 pint. Strain into a basin into which you have measured ½ lb. sugar, stir until sugar is dissolved. Allow it to become quite cold. Place a block of ice, if available, in punch bowl and strain over the tea 1 pint orange juice and ½ pint lemon juice. Add 4 tablespoons maraschino, 2 pints ginger ale, 2 pints soda-water, and 1 pint lemonade. Decorate punch bowl with thin slices of orange and fresh sprigs of mint.

Orange Milk Shake.

Mix together 3 cups orange juice, 2 cups grapefruit juice, 1 cup water in which ¼ cup castor sugar has been dissolved, a pinch salt, and, if liked, a few drops almond essence. Lastly add 1½ cups evaporated milk and 2 cups ice, broken into very small pieces. Place into a large jar and mix well. This is a delicious hot-day drink.

Ginger Punch.

Boil for twenty minues 1 quart water, 1 cup sugar, and ½ cup ginger syrup. Allow to become quite cold, then add the following:—One cup orange juice, ½ cup lemon juice, ½ cup finely chopped preserved ginger (optional), 1 bottle lemonade, and 2 pints soda-water. Serve cold.

Claret Punch.

Place ¼ packet raisins in a saucepan with 1 quart water and boil for twenty minutes. Remove raisins and add 2 cups sugar, the thinly peeled rind of 1 lemon, and about 3-in. stick cinnamon. (Do not use ground cinnamon.) Boil for another five or six minutes. Cool a little, then add 2 cups orange juice, ½ cup lemon juice, and ½ cup grapefruit juice. Cool thoroughly, then strain over a block of ice, if available, with 1 pint bottle claret.

Grape-Juice Punch.

To each bottle grape juice add 4 tablespoons sugar, half cup limejuice, 1 pint bottle lemonade, and 2 pints soda-water. Pour contents over a large block of ice, if available, and serve thoroughly cold.

Pineapple Cup.

Mix together 4 cups cold strained tea, the juice of 6 oranges and 6 lemons. Boil together 1 medium-grated pineapple, 4 level cups sugar, 8 cups water for twenty minutes. Allow to cool, then add fruit juices, tea, &c. Pour over a block of ice, if available, and decorate with slices of fruit.

Fruit Cup.

Mix together 2 pints cider, the juice of 2 lemons, 2 oranges, and 2 cups pineapple juice. Stir in 2 pints grape juice and 1 cup sugar; allow to stand for about one hour. Now add 3 or 4 sliced oranges, 1 sliced apple, 2 or 3 slices lemon, a sliced banana, a few maraschino cherries or strawberries, and 2 or 3 passion-fruit. Add a piece of ice and serve very cold.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1940.	Oct., 1939.
North Coast.	In.		In.	In.
Atherton	2·67	39	0·22	5·59
Cairns	3·87	58	1·68	3·53
Cardwell	4·17	68	0·30	4·97
Cooktown ..	2·49	64	0·83	0·56
Herberton ..	2·65	54	0·08	4·35
Ingham	3·80	48	0·28	1·93
Innisfail	6·35	59	1·83	5·55
Mossman Mill ..	4·77	27	0·89	10·16
Townsville ..	2·56	23	0·18	1·43
Central Coast.				
Ayr	1·73	53	..	0·52
Bowen	1·28	69	0·24	2·61
Charters Towers ..	1·43	58	..	0·18
Mackay P.O. ..	3·07	69	0·04	1·59
Mackay Sugar Experiment Station	2·81	43	0·16	1·33
Proserpine ..	2·85	37	0·92	0·69
St. Lawrence ..	2·40	69	0·06	2·34
South Coast.				
Biggenden ..	2·86	41	0·28	4·49
Bundaberg ..	2·79	57	0·50	5·41
Brisbane	3·77	88	1·97	2·54
Caboolture ..	3·65	53	3·25	4·18
Childers	2·86	45	0·92	5·25
Crohamhurst ..	4·61	47	1·71	3·02
Esk	3·29	53	1·43	2·41
South Coast—contd.	In.		In.	In.
Gatton College ..	2·90	41	0·58	3·54
Gayndah	3·01	69	0·08	3·41
Gympie	3·30	70	0·29	3·27
Kilkivan	2·65	61	1·30	1·43
Maryborough ..	3·23	69	0·62	2·83
Nambour	4·27	44	0·95	4·09
Nanango	2·82	58	0·93	2·48
Rockhampton ..	2·49	69	0·16	4·66
Woodford ..	3·28	53	1·15	2·07
Central Highlands.				
Clermont ..	2·07	69	..	1·94
Gindie	2·21	41	..	1·39
Springsure ..	2·32	71	0·02	2·78
Darling Downs.				
Dalby	2·89	70	0·50	2·05
Emu Vale ..	2·79	44	0·90	2·97
Hermitage ..	2·58	33	..	..
Jimbour	2·61	52	0·13	2·00
Miles	2·63	55	0·96	0·87
Stanthorpe ..	2·73	67	1·17	1·74
Toowoomba ..	3·35	68	0·75	3·93
Warwick	2·65	75	0·94	2·26
Maranoa.				
Bungeworgorai ..	2·18	26	..	0·82
Roma	2·16	66	0·24	1·58

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1940.

COMPILED FROM TELEGRAPHIC REPORTS.

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	..	83	71	86	31	64	2	83	5
Herberton	..	79	55	91	29	48	1, 9	8	2
Rockhampton	30·12	87	63	101	28	55	1, 4	16	1
Brisbane	30·17	78	61	94	28	53	2	197	7
Darling Downs.									
Dalby	..	86	55	100	23	38	1	50	3
Stanthorpe	..	78	49	93	23	32	1	117	3
Toowoomba	..	78	54	92	23, 24	43	4	75	3
Mid-Interior.									
Georgetown	30·03	95	64	102	22, 23, 29	48	3	..	..
Longreach	30·04	97	63	107	23	47	1, 2	..	..
Mitchell	30·07	90	56	104	23	37	1	26	2
Western.									
Burketown	..	91	67	102	25	55	1, 2	..	..
Boulia	29·96	97	67	109	23	48	1	8	2
Thargomindah ..	30·03	91	62	107	23, 30	51	2	17	2

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ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by A. K. CHAPMAN, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1940.		January. 1941.		MOONRISE. Dec. 1940.	MOONRISE. Jan., 1941.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	4·49	6·34	5·0	6·50	6·29	8·3
2	4·49	6·35	5·1	6·50	7·27	8·58
3	4·48	6·35	5·2	6·50	8·25	9·52
4	4·48	6·36	5·2	6·50	9·22	10·44
5	4·48	6 37	5·3	6·50	10·17	11·35
						p.m.
6	4·48	6·38	5·4	6·50	11·11	12·26
					p.m.	
7	4·49	6 39	5·4	6·51	12·2	1·17
8	4·49	6·39	5·5	6·51	12.53	2·9
9	4·49	6 40	5·6	6·51	1.44	3·1
10	4·49	6·41	5.7	6·51	2·35	3·54
11	4·50	6 41	5·7	6·51	3·27	4·47
12	4·50	6·42	5·8	6·51	4·18	5·38
13	4·50	6·43	5·9	6·51	5·11	6·29
14	4·50	6·44	5·10	6·51	6·4	7·17
15	4·51	6·44	5·10	6·51	6·56	8·3
16	4·51	6·44	5·11	6·51	7·47	8·47
17	4·51	6·45	5·12	6·51	8·35	9·29
18	4·52	6·46	5·12	6·51	9·21	10·11
19	4·52	6·46	5·14	6·51	10·5	10·53
20	4·53	6·47	5·15	6.51	10·47	11·37
21	4·53	6·48	5·16	6·51	11·28	..
						a m.
22	4·54	6·48	5·17	6·50	..	12·22
					a.m.	
23	4·54	6·48	5·17	6·50	12·9	1·11
24	4·55	6·49	5·18	6·50	12·52	2.4
25	4·55	6·50	5·19	6·50	1·37	2·58
26	4·56	6·50	5·20	6·49	2·26	3·55
27	4·56	6·50	5·20	6·48	3·17	4.53
28	4·57	6·51	5·21	6·48	4·12	5.50
29	4·57	6·51	5·22	6·48	5·10	6·46
30	4·58	6·51	5·22	6·47	6·8	7·40
31	4·59	6·51	5·23	6·47	7.7	8·34

Phases of the Moon, Occultations, &c.

7th Dec.	☽	First Quarter	2 1	a.m.
15th ,,	○	Full Moon	5 38	a.m.
22nd ,,	☾	Last Quarter	11 45	a.m.
29th ,,	●	New Moon	6 56	a.m.

Apogee, 9th December, at 6.0 p.m.
Perigee, 25th December, at 4.0 p.m.

Mid-summer will arrive in Queensland on 22nd December, when the sun will reach his farthest south; Rockhampton, Longreach, and Emerald will then pass under his vertical rays.

The summer night sky is more thickly star-strewn with faint and brilliant stars than at any other time of the year. About Christmas the moon will be absent and the Milky Way will span the eastern heavens like a mighty arch. The South Celestial Pole is a point in the sky which is the same number of degrees above the south point on the horizon as the latitude of the place the observer is in. Near this point is, what appears to be two island-like pieces of the Milky Way, at a distance from the main arch. These are the Megellanic Clouds, the largest is 112,000 light years while the smaller is 95,000 light years from us; a light year is about six billion miles. The smaller cloud is so large that light, travelling at the rate of 186,000 miles per second, takes 6,000 years to pass from one edge to the other. These figures are accurately known.

In the Milky Way the Southern Cross may be seen rising in the south-east after an absence from the evening sky. In line with the Megellanic Clouds, toward the Milky Way is Canopus in Argo, the Ship, the second brightest star in the sky. The brightest of all stars is Sirius, the Greater Dog Star, which is still higher and on the western edge of the Milky Way. This is a neighbouring sun, it being but nine light years away. Bright stars must not be confused with the planets Jupiter and Saturn, which are near each other but much farther west. Across the Milky Way but higher than Sirius is Procyon, the Lesser Dog Star. These two dogs attend Orion, the giant, which is well known with his belt of three stars and sword hanging therefrom.

Away in the northern part of the Milky Way the brilliant Capella shines. Not far from Capella is a small star which was recently found to be a remarkable binary. One of the components is a giant red, and the other an extremely hot, blue star. Every 972 days the red giant takes 30 days to pass between us and the brighter blue star.

5th Jan.	☽	First Quarter	11 40	p.m.
13th ,,	○	Full Moon	9 4	p.m.
20th ,,	☾	Last Quarter	8 1	p.m.
27th ,,	●	New Moon	9 3	p.m.

Perigee, 19th January, 6.0 p.m.
Apogee, 6th January, 3.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 3[illegible] minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night: when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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164 7 104566 12